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the OIL AND GAS JOURNAL

APRIL 6, 1959

EDITORIAL 75
EXPLORATION 183
STATISTICS 208

Small gasoline plants on the move ▸80

IPE picks grand old men of oil ▸86

Iran offers new concession area ▸102

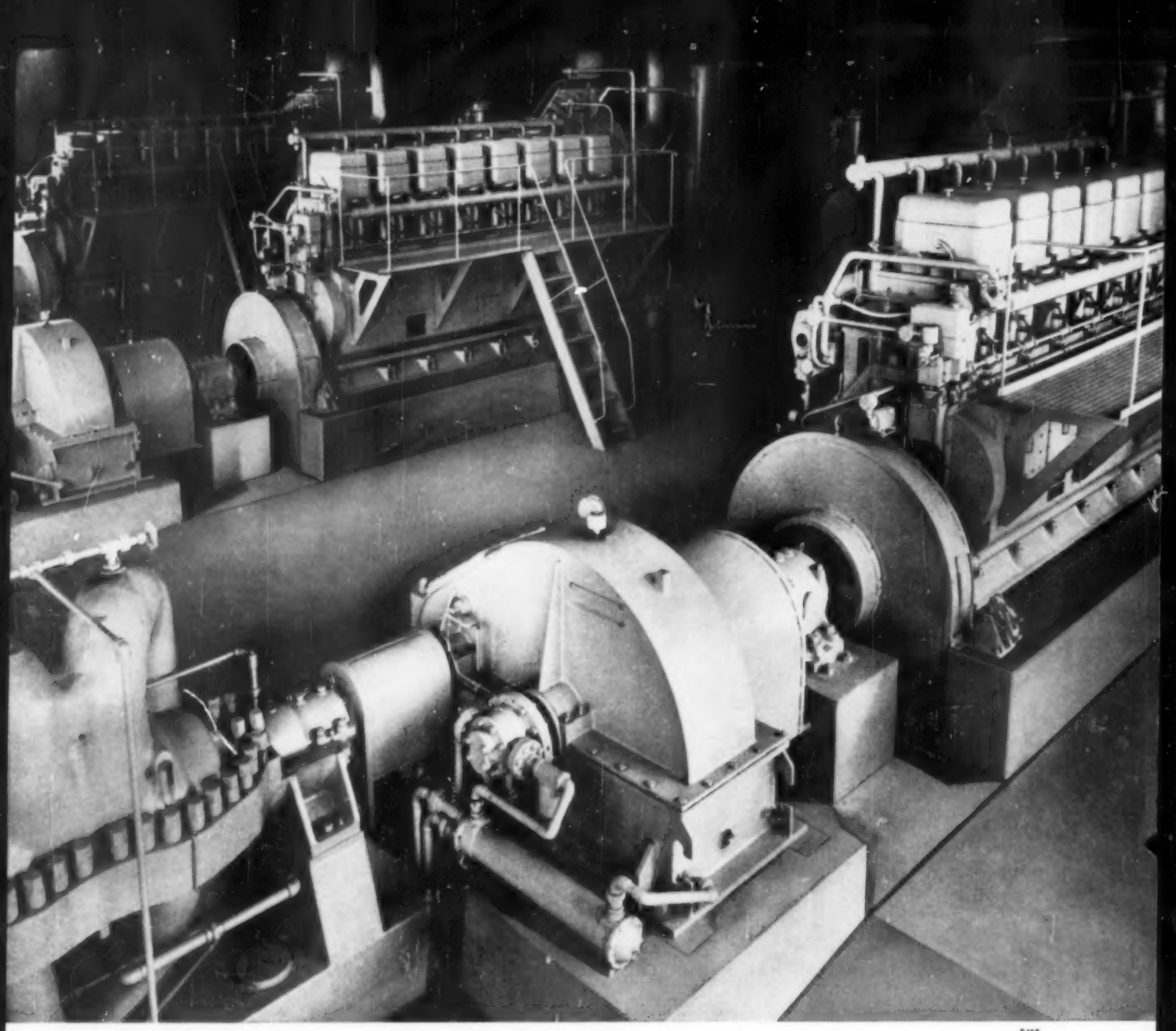
An engineer looks at steam rigs ▸121

API standardizes mud-log form ▸151

WHAT TRANSCO LEARNED ABOUT

Internal Coating of Gas Pipelines

BEGINNING PAGE 107



0459

Pipe line engines by Nordberg

Unattended, remote control operation of six Nordberg engine-pumping units is an important feature of the Evangeline Products Pipe Line System. Three Nordberg 1720 horsepower, four-cycle engines are installed in two identical, full satellite pumping stations on the 16-inch products line.

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MILWAUKEE 1, WISCONSIN

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the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
April 6, 1959

Orders for oil-country tubular goods are slowing up:

Shipments of steel goods, however, are still very brisk.

Supply people give this analysis: Larger companies have protected themselves against possible steel strike with heavy orders for delivery in second quarter. Independents, however, mostly have bought only for current needs.

Result is that the larger companies will keep on drilling through a steel strike. Many smaller operators will start shutting down if a strike should extend over 30 days.

Buying of sucker rods, pumping units, and other equipment items has not been affected by the steel-strike scare. Sales have been better than last year in most instances, reflecting improved business conditions.

What are odds for a strike? Supply people report they still indicate a strike this summer. A long one could put a crimp in some oil operations.

▼ ▼ ▼

Shortage of electronic technicians is plaguing refiners as the automation trend grows.

Complicated apparatus being installed in many plants is solving vexing problems but its maintenance troubles refiners. The average instrument department contains few individuals who can cope with the more advanced equipment.

Some companies are giving their technicians intensive courses in electronics. Others are bringing in top-salaried technicians from outside the industry to bolster their staff.

One possible solution: Built-in circuit analyzers. They may add to cost of the equipment. But their simplicity in diagnosing trouble makes it possible for repairs to be made with only a minimum of experience and training for instrument men.

▼ ▼ ▼

Branched chain paraffins will be the fair-haired boys in our future gasolines.

Technical papers on refining are pointing definitely to the need for more alkylation and isomerization and for better methods of separating the low-octane straight-chain paraffins from their high-powered isomers. Watch for molecular sieves to enter this picture.

Jet fuels, on the other hand, will trend in the other direction—toward the polycyclics.

These fuels of the future may become high-priced tailored hydrocarbon blends.

Military avgas specs have been modified slightly.

All blends, beginning July 1, must contain at least 5% aromatics.

Official reason for the change: Operational difficulties. Informed sources say gaskets in fuel lines tend to harden with only alkylate and isopentane in the blend.

Any great upsurge in aromatics production is not expected, however. Many refiners already blend more than the minimum amount of aromatics, principally toluene.

Pocket-size gasoline plants are on the rise.

The short-cycle adsorption units will make money in operations too marginal for conventional units. Between 50 and 60 of the units are being installed this year with payout on initial investment expected in from 1 to 3 years (p. 80).

▼ ▼ ▼

Import quotas have now been set for residual fuel oil and other finished petroleum products.

Quotas will limit residual imports to 347,311 bbl. daily and other products to 76,646 bbl. The total of 423,957 bbl. daily is about 45,000 bbl. daily less than had been expected under new program.

The quotas for finished products were based on actual imports of companies in 1957 (p. 77).

Gulf's price cuts are not start of a new round.

Statistics back up company explanation of the 7-cent cuts along Texas and Louisiana Gulf Coast and at Citronelle. It claims the cuts merely put these crudes in competitive position with oil cut several months ago (p. 85).

Other price news: Pennsylvania-grade crude is up 10 to 17 cents a barrel...Union Oil restores cuts on California and Four Corners crude. What's more, the new postings represent a 10-13 cent net increase in Four Corners and a 1 to 7-cent hike for middle gravities in California.

▼ ▼ ▼

Pioneer venture in major airport pipelining to serve jet age has started in Florida.

It's a 34-mile, 10-in. common carrier products line from Port Everglades to Miami International Airport. Owner is the Everglades Pipe Line Co. which has a unique management agreement with Buckeye Pipe Line (p. 96).

A new big-inch intrastate gas line looms for Texas.

It is planned to link the Dallas-Fort Worth area with the Gulf Coast gas-producing region. Line will serve a big industrial customer which will pay more than 20 cents M.c.f. for the gas.

How far automation has progressed in gas pipelining is seen in one project now before FPC.

Design provides for remote control of reciprocating compressor stations.

Internal coating may become standard practice on gas-line construction.

This prediction follows a study just completed which shows that an epoxy resin internal coating results in a 5% increase in transmission capacity.

The coating reduces pipe-wall roughness and thereby improves efficiency of even "smooth" new pipe. Improvement is much greater on pipe which has rusted in storage for several months before being laid (pp. 90 and 107).

Plans for an Alberta-Minneapolis gas line by Northern Natural are in the spotlight again.

Company has had its eyes on such a line for years. It has substantial gas reserves in Alberta and a good market in the Great Plains region.

A gas-supply office recently was opened in Calgary, reviving talk of the line. Northern, however, has taken no step to push the project and says its status has not changed.

Target for completing the Katy-New York Central LPG pipeline from Southwest producing areas to northern markets has been changed from 1959 to 1960.

Officials report they're still actively pushing the financing of the project.

▼ ▼ ▼

More operators seem to be taking advantage of pre-planned multiple drilling programs.

Examples: Calvert Drilling has 25 to 30 wells calendared for northwestern Oklahoma gas areas. Davis Oil of Denver plans 11 wildcats—5 in Wyoming's Powder River basin, and 6 in Denver basin. Sands Oil of Tulsa will explore southeastern Colorado with 11 ventures.

Advantages of such programs reportedly lie in savings to be realized in contracts for drillings, equipment, supplies.

A blowout has caused damage exceeding $200,000 to drilling equipment of Loffland Brothers in Argentina.

Well being drilled for Pan American in Sarmiento field went wild at 1,500 ft. while crew was pulling the string. Gas channeled 50 ft. from the well bore and then caused a crater.

The substructure, mast, and trailer were lost.

Look for southwestern Colorado to get hot drilling play on heels of Lion Oil's strike, 8 miles north of Towaoc, where Texaco made the area's first big find.

Lion 1 Retherford flowed 20 bbl. an hour from 5,820-99 ft. in early testing. It's the second commercial well in the Colorado portion of Paradox basin and the biggest news in that region since Aneth (p. 183).

A new field of major proportions may emerge south of Swan Hills field in Alberta.

Imperial has staked five wells to evaluate the area where Imperial, British American, and Pan American opened new pools at Sarah Lake and Judy Creek.

Big gas wells are becoming the rule on the Gulf Coast.

Late completions: A 124,000 M.c.f. well by Phillips at Alta Loma in Galveston County; a 122,000 M.c.f. well by Peter Henderson at Port Acres in Jefferson County; a 96,000 M.c.f. producer by Michel Halbouty in same field; and a 144,000 M.c.f. well by Texkan Oil at East Mustang Creek in Jackson County.

▼ ▼ ▼

Iniskin Bay wildcat of Alaska Consolidated is getting the full technical treatment. All the modern drilling and completion techniques are being used on the well (p. 79).

Crew now is drilling below 5,100 ft. Program calls for continuous drilling, continuous logging, use of special drilling fluids, and use of hydraulic fracturing if necessary.

Iran is dangling a tremendous block of remote interior acreage before the oil industry for competitive bidding (p. 102).

It's an attempt by Iran to expand its oil industry beyond the present coastal areas.

At first blush, area might not appear too attractive because of its remoteness. But the bidding could turn up some surprises. Foreign concession areas at the moment are scarce.

▼ ▼ ▼

Threat of radioactive pollution from underground blasts is discounted by Canada's chief of mines, Dr. John Convey. He says fission materials produced remain trapped underground, and any oil produced by the heat is not polluted.

Dr. Convey reveals that if the initial atomic blast planned in Alberta's Athabasca tar sands is successful, an all-out attack will be made. This calls for a series of hydrogen bomb blasts set off at the same time.

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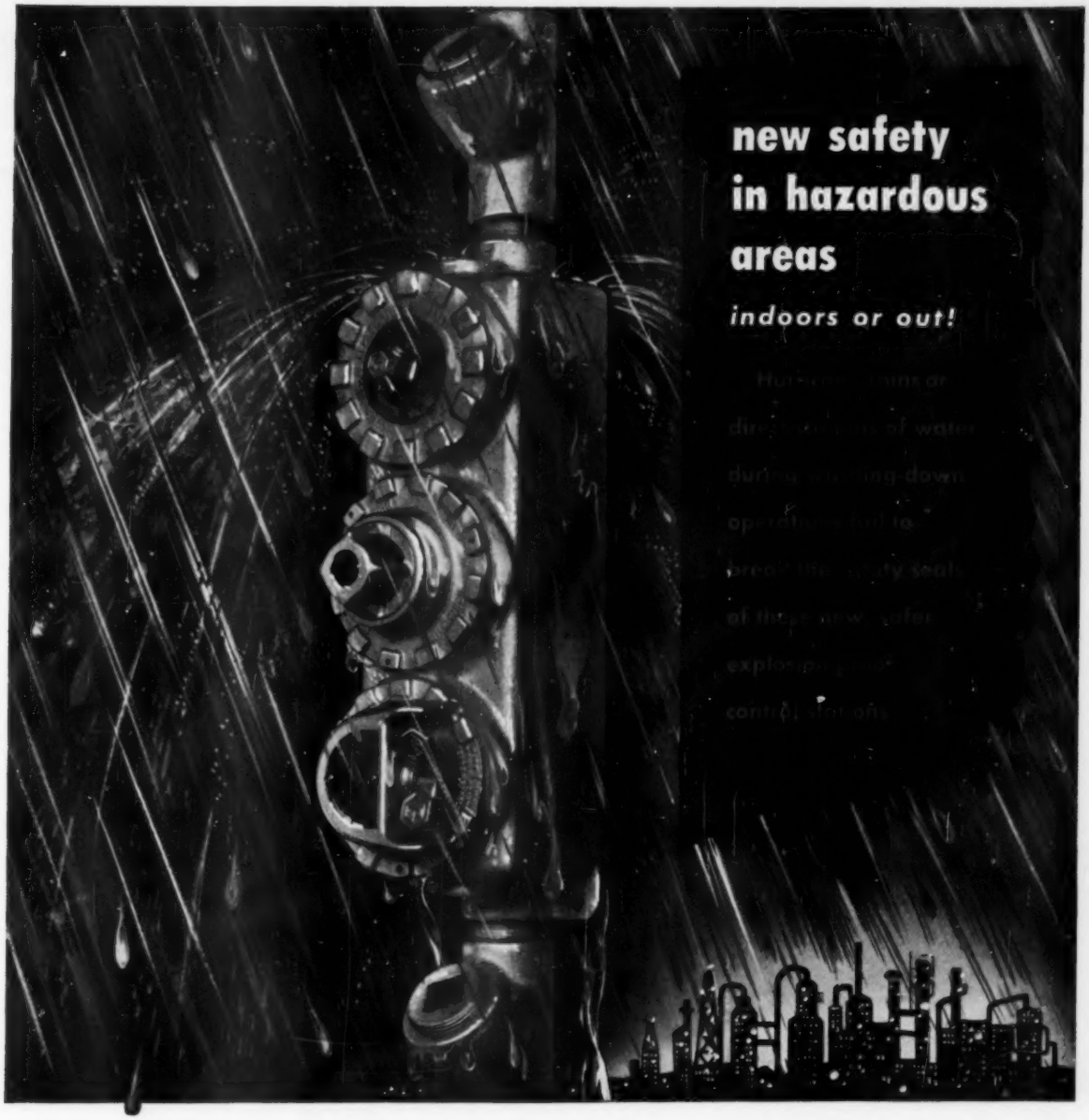

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IN THE NEWS

General Interest:

Products Imports Quotas Lower Than Expected 77
Latest Changes May Stabilize Crude Prices 85
Industry to Honor Eight Oil Pioneers at Big Oil Show 86
Texas Legislature Hasn't Followed Up Imports Study 98
Pan Am Attacks Texas Ratable-Gas-Take Order in Court 98
Oil Plans Big Birthday Party in Titusville This Summer 98

Pipelining:

Texas Eastern Starts World's Biggest LPG Reservoir 84
FPC Examiner Turns Down Trunkline Gas Expansion 88
Internal Pipe Coating Boosts Gas-Line Capacity 90
Florida Airport Pipeline to Serve Jet Age 96
Pipeline Briefs 96

Drilling-Production:

Import Controls Lower Alberta Crude Nominations 98
Free-World Crude Output Hits All-Time High 106

Processing:

Texaco Has First Full Automatic Process Unit 78
Short-Cycle Gasoline Plants Gaining in Favor 80
Demand for Hydrocarbon Jet Fuels Is Rising 82
Exotic Fuels Won't Take Over From Hydrocarbons 82
Processing Briefs 88
New Gas-Processing Techniques Are Promising 94
Octanes Are Climbing at Faster Pace Than Last Year 97

Foreign News:

Iran Puts Up Inland Acreage for Competitive Bidding 102
Australian Program Started With First Wildcat 103
Venezuela Sun Is Building Lake Maracaibo Pipeline 103
French Make Most Promising Find in Paris Basin 104
Peru's First Ammonia Plant Nears Completion 104
French Set Price of Gas From Algerian Field 105

Exploration:

Alaska's Iniskin Area Tested Anew 79
New Finds Push Paradox Play Into Colorado 183
Exploration Outlook 184
West Texas Drillers Are Going Deep 185

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
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TECHNOLOGY—OPERATION

Pipelining

Internal Coating of Gas Pipelines 107
By Raymond H. Crowe
Preliminary results of 87 flow tests on both bare and internally coated 30 and 36-in. pipelines indicate a healthy increase in pipeline-flow efficiency for coated pipe. Transcontinental Gas Pipe Line Corp. has internally coated 1,199 miles of pipeline ranging in sizes from 20 to 36 in. in diameter during the past 4 years.

Solvent Treating Method Cleans Tanks Without Shutdown 161
By Gene Kinney
Solvent cleaning is being used successfully for storage tanks on trunk pipelines and at refineries. The hydrocarbon solvent removes marketable oil from b.s. and w. and the solution from the tank is pumped into the pipeline stream.

Refining-Processing

Molex Process Upgrades Gasoline 112
By D. B. Broughton and D. B. Carson
Even the best gasolines marketed today contain appreciable quantities of normal paraffins—materials so inferior that they are used as the lower standard on the octane-performance scale. The Molex process provides the industry with a practical tool for the clean removal of these low-quality components.

Selective Finishing Process Has Reached Commercial Stage 116
By W. F. Franz, E. R. Christensen, J. E. May and H. V. Hess
Texaco selective finishing uses molecular sieves to process a wide variety of stocks. Low octane number straight-chain components are removed and the remaining gasoline stream is significantly upgraded.

Air Cooling Saves for Sohio 131
Air cooling is more economical than conventional water cooling for many applications, even in locations where fresh water is plentiful. Some 20% of the cooling and condensing at Sohio's Toledo refinery is being done by air.

Refinery Construction Index 156

Process Costimating 158
How type of management affects labor requirements.

Quarterly Costimating Index 166

Drilling-Production

Steam Drilling Rigs Are Competitive in Certain Areas 121
By E. D. Arnold
Where an ample supply of gas is available and where there is abundant supply of good water, many steam rigs have remained competitive because of low depreciation, economic repair and maintenance, and simplicity.

Pan American Repairs Casing With Plastic 136
By E. R. Jennings and R. P. Vincent
New method for repairing holes in well casing has been used in 13 field wells and has proved successful in a gratifying number of them. The new method is one of forming a laminated liner over the hole in the casing.

Links Feed Off Extra Wire Safely 146

API Standardizes Mud-Log Form 151
By Robert J. Enright
Wide use of this form by mud-logging service companies and operators will wipe out much of the current confusion and difficulty operators now experience in using mud-log data due to widely varying types of reports.

DEPARTMENTS

Advertisers' Index 217
Book Review 128
Calendar of Events 65
Classified Advertising 214
Discovery Wells 197
Drilling Contractors 181
Drilling Statistics 209
Editorial 75
Equipment Men in the News 178, 213
Exploration Highlights 183
Foreign News 102
Journally Speaking 73
Markets 212
New Equipment 169
On the Job—Pipelining 161
Personals 203
Process Costimating 158
Refinery Construction Index 156
Refining Statistics 211
Statistical Summary 208
Supply Statistics 210
They Say 62
Trade Literature 176
Watching Washington 91

Norris Suggests:

Keep Clean Rods Clean

to Reduce Your Pumping Costs

Helpful Hints

- CLEAN JOINTS BEFORE DOPING. Don't "grease-in" dirt and foreign matter to cause thread and joint trouble later.
- KEEP TOOLS, EQUIPMENT, EVEN GLOVES, REASONABLY CLEAN. Avoid chance "planting" of dirt and abrasives. Good housekeeping *does* pay!
- KEEP DOPE BUCKETS AND BRUSHES PROTECTED. Avoid "mixing-in" dirt and dust.

Rods are delivered from the factory in top condition. Maximum life and service results from *reasonable* rod care.

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B.F.Goodrich V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

The right way to install and run-in V belts

To get the most possible life out of a set of V belts you've got to install them and run them in properly:

To install V belts:

1. Move driver unit toward driven machine so that belts may be placed in sheave grooves by hand.
2. Work belt slack to top side of drive.
3. Move driver unit back into position, eliminating all belt sag.
4. Check sheave alignment.

To run-in V belts:

1. Start unit and operate long enough to permit belts to properly seat in grooves.
2. Stop unit. Adjust centers as necessary until all belts have proper tension.
3. Review adjustment from 24 hours to 48 hours after drive is in operation. This is important, for new belts stretch slightly and seat in grooves before reaching their working lengths.

It pays to keep belts stored properly

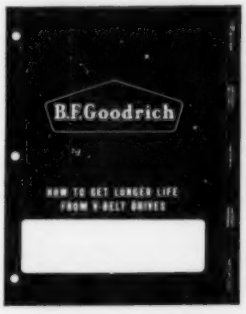
V belts should be stored in a cool, clean, dry place. Avoid heat and direct sunlight. Do not hang on nails or other small objects which might cause a sharp bend or tension that would result in a permanent set in V belt. Oldest belts should be used first to keep fresh stock. Matched belts should be banded together so they don't become separated.

FOURTEEN BELTS BEAT THE WEATHER — *These B.F.Goodrich Grommet belts have stood dirt, dampness, all kinds of weather and the heavy shock loads of a mud pump since they were first installed over 2½ years ago. They've required less takeup than any other belts used by this drilling company, have not caused any shutdowns. When the picture was taken these belts showed little cover wear, looked good for many more years of trouble-free service.*

What caused this V belt failure?

Answer: Prematurely worn sides are caused by grit, dirt or any such abrasive contact. Misalignment often causes wear on one side only. To prevent, align the sheaves, checking with straight-edge or cord. Keep belts and sheave grooves clean.

B.F. Goodrich V belt manual



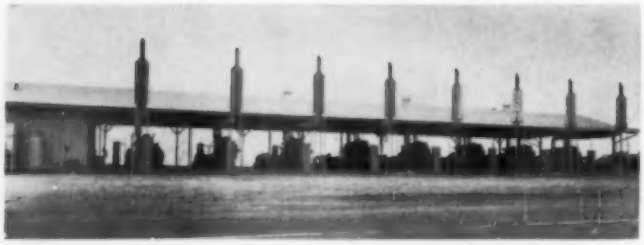
The illustrated pages of this new B.F.Goodrich V belt maintenance manual contain information that will help you get longer life from your V belt drives. Its 12 illustrated pages contain information on how V belts work, how to select V belts that fit, how to install, how to keep them running, and how to spot trouble. To get your free copy, call any of these B.F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *B.F.Goodrich Industrial Products Company, Department M-561, Akron 18, Ohio.*

Take a look inside with this X-ray of a Grommet belt

This model of a B.F.Goodrich Grommet belt was made of a transparent, flexible material so that you can see its grommet construction. The two endless loops you see are grommets, the load-carrying members of the B.F.Goodrich belt. These are made by winding heavy cord on itself to make an endless cord grommet.

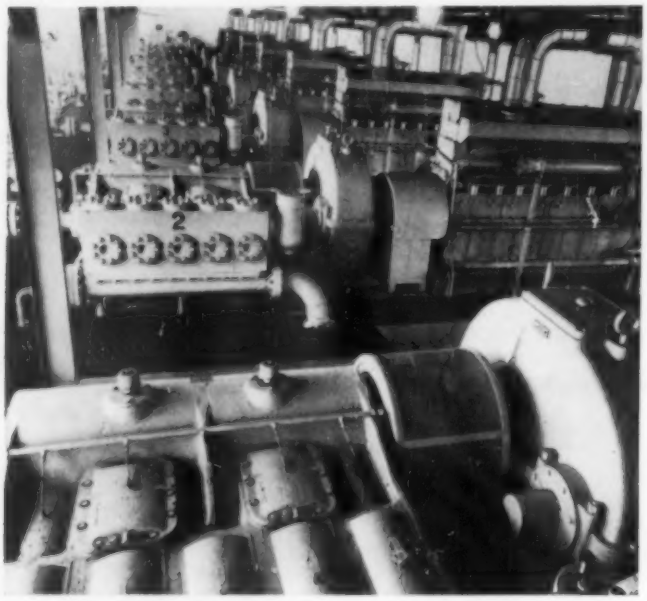
In the actual belt, these grommets float in a bed of solid rubber. You can *see* why every part of the belt is equally flexible—there are no stiff plies to resist bending. Most cord failures occur where cords overlap. But in the B.F.Goodrich Grommet belt with endless cord construction this cause of failure is eliminated.

B.F.Goodrich V belts



They're actually pumping the ocean . . .

with "Oilwell" 558-P Quintuplex Plunger Pumps



Horizontal design assures quiet operation with minimum vibration and makes working parts readily accessible for servicing.

THE WORLD'S MOST INTERESTING WATERFLOOD PROJECT is under way. The first batteries of "Oilwell" Pumps are injecting sea water into the oil sands of the Wilmington field in the Long Beach Harbor area.

Eight "Oilwell" 558-P Quintuplex Plunger Pumps are in operation at the location shown, and four more are installed at a second station. Each pump delivers a volume of 13,000 to 20,400 bpd at pressures up to 2,000 psi, driven by a 580-hp gas engine through a reduction gear unit.

The conservative operating speed of these pumps will keep maintenance at a minimum. Any attention required will be simplified by their compact horizontal design, making working parts readily accessible.

Oil Well Supply makes a variety of superbly engineered pumps to fit all types of waterflood projects. Their "long service—low maintenance" records are worth investigating. "Oilwell" representatives will gladly talk with you about pumps for your next waterflood project.

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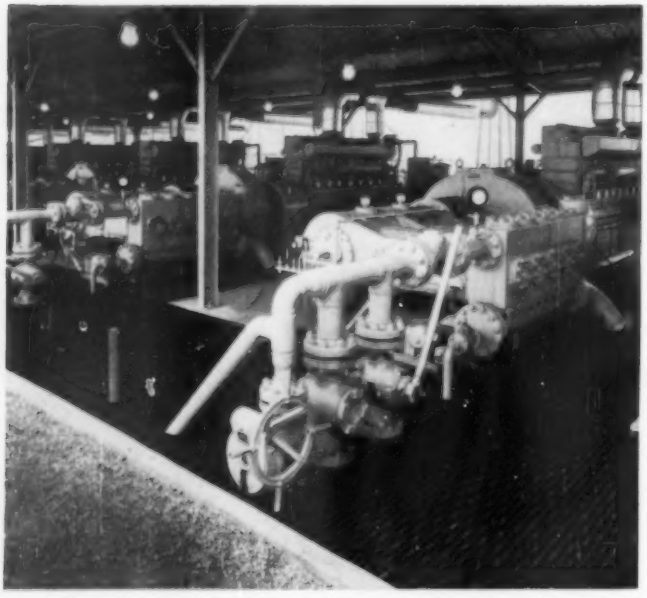

◀ Liquid ends are externally and internally machined from solid billets of aluminum bronze for maximum strength and resistance to sea water.

Oil Well Supply
Division of
United States Steel

USS

Executive Offices—Dallas, Texas
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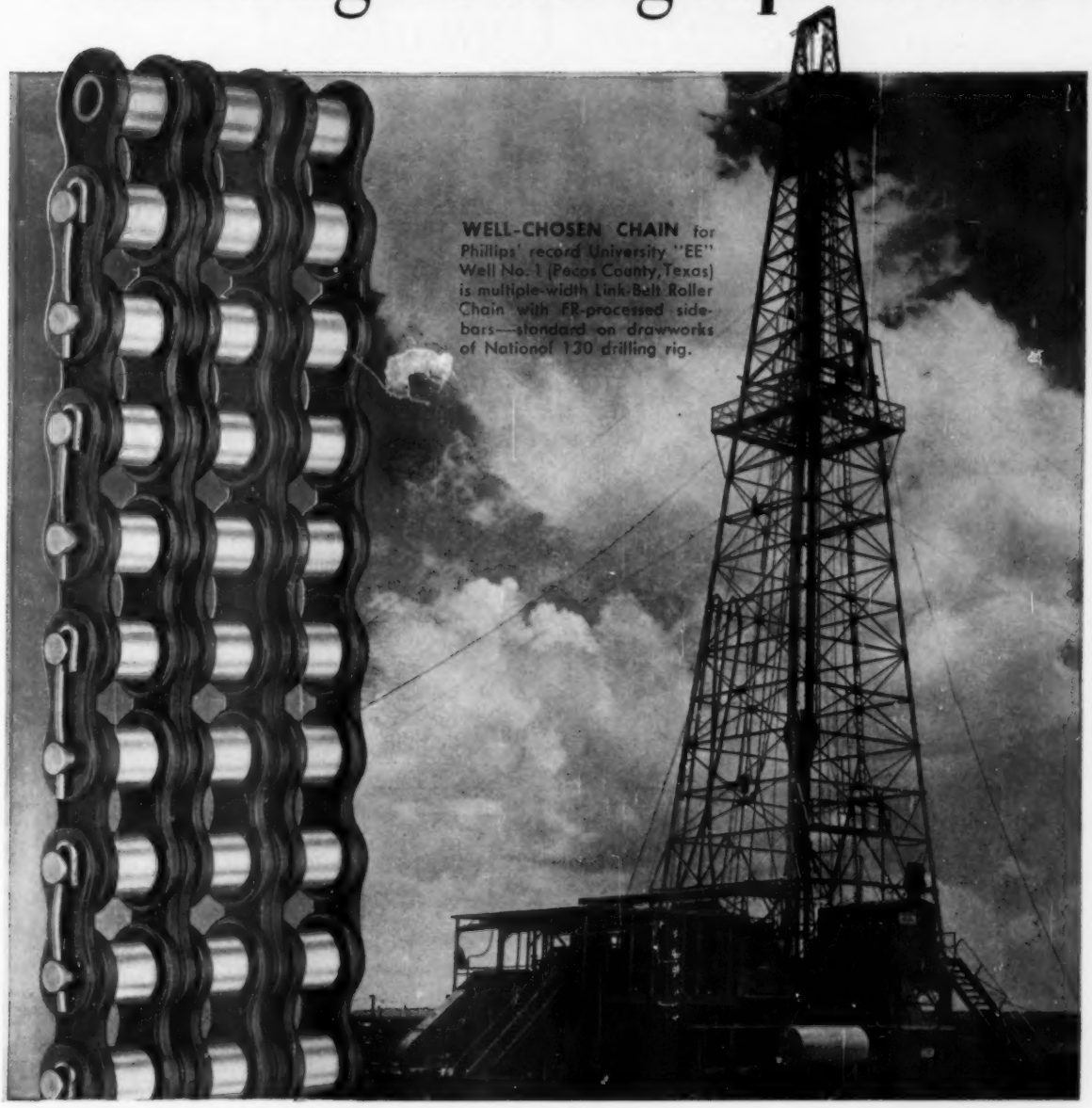
Again! Link-Belt roller chain helps set

sixth straight drilling depth record


WELL-CHOSEN CHAIN for Phillips' record University "EE" Well No. 1 (Pecos County, Texas) is multiple-width Link-Belt Roller Chain with FR-processed sidebars—standard on drawworks of National 130 drilling rig.

LINK-BELT Fatigue Resistant sidebar processing proves itself on world's deepest oil well

FOR the sixth straight time, the world's drilling depth record has been set by a rig equipped with Link-Belt roller chain. New record: more than 25,000 feet.

It's easy to see that no ordinary chain drives could withstand such brutal punishment—twelve-hour round trips . . . hard formations that slowed down drilling to two feet an hour. That's why Link-Belt Fatigue Resistant ("FR") Roller Chain was used throughout.

"FR" is Link-Belt's patented process for compressing the metal around roller chain pitch holes . . . the critical areas most vulnerable to fatigue failure. The result: a tremendous increase in dynamic strength. And greater endurance to "make hole" more dependably . . . to get you back without breakdown. 15,099

The complete line of Link-Belt oil field equipment is covered in Composite Catalog 2880—available from any leading supply store in the field.

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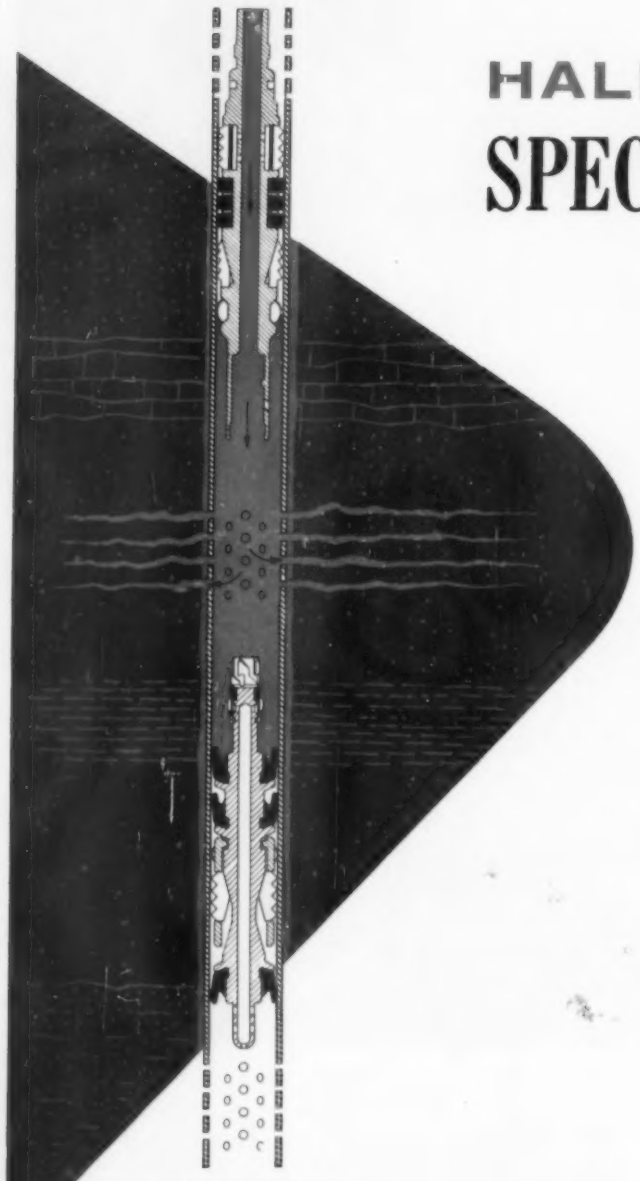
SPECIAL TOOLS



OPERATIONAL DIAGRAM CUP TYPE
RETRIEVABLE BRIDGE PLUG
WITH "RTTS" PACKER

Although flexibility in design permits the advantageous use of Halliburton Special Tools for a multitude of jobs, zone isolation for production improvement is one of their most profitable applications. This is accomplished by forcing a treating fluid into the formation to remove flow restrictions in the naturally permeable channels, or to enlarge the flow channels by chemical action or hydraulic fracturing.

Halliburton Special Tools include well-engineered packers and auxiliary tools that are run on tubing into the cased hole to isolate the zone to be treated. This procedure is designed to force the treating fluid into the designated zone, confine the high pressure to this section only, and realize the maximum production from the well's potential.

Use the unmatched performance of Halliburton Special Tools for the production improvement of your wells. A call to your nearby Halliburton office will bring full information about the Special Tools best suited for your specific requirements. Call Halliburton today!

HALLIBURTON "R-3" TREATING PACKER

This new economical—short—compact—retrievable tool is used for treating—water flooding—production. It is run into cased hole on tubing to isolate a section to be treated and may be run repeatedly. Consists of a packer rubber, drag springs and mechanical type slips mounted in a sleeve, and a J-slot arrangement. Full opening mandrel permits passage of wire-line type tools, instruments or perforating guns. A safety joint within the tool itself allows the tubing to be disengaged by right hand rotation, if the tool should become stuck; packer is easily drilled if conditions prevent normal removal. Available in 4½", 5½", and 7" O. D. casing sizes.

HALLIBURTON CUP TYPE RETRIEVABLE BRIDGE PLUG

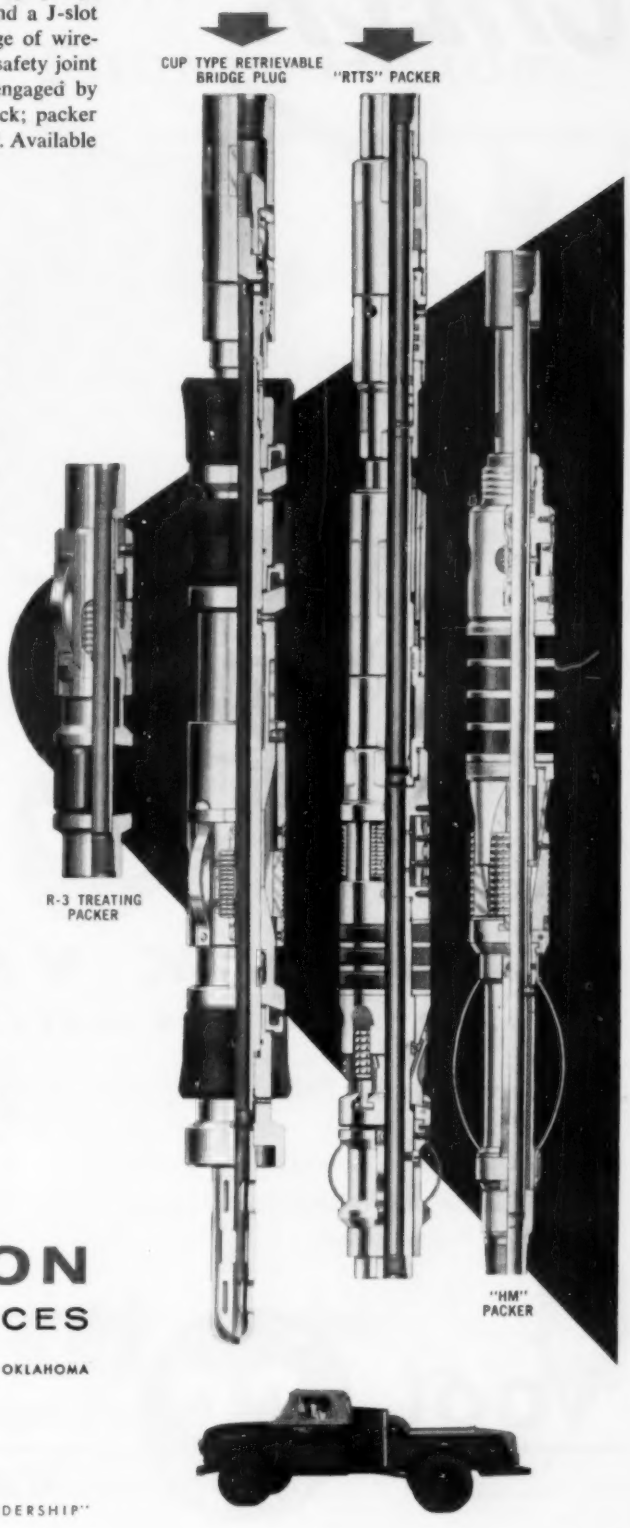
Designed to provide a positive but easily removable plug in cased hole to hold pressure from either above or below. Valuable in providing straddle packer type isolation of zones with virtually unlimited spacing between packers without restriction of flow passage. Especially adapted for running in below a retrievable tool such as the "RTTS" Packer for isolation of one or more zones. Setting and retrieving functions of the Bridge Plug are matched to the "RTTS" Packer; this combination permits "straddling" of any desirable zone, so that multiple zones can be isolated individually with only one trip in the hole.

HALLIBURTON "RTTS" PACKER

The industry's most efficient multi-purpose tool, the Retrievable Test-Treat-Squeeze Packer, is designed for testing, treating and squeezing operations. It permits combination high pressure treating and squeezing applications, as well as testing, with *only one trip into the hole.* Equipped with full-opening fluid passage . . . incorporates circulating valve and safety joint.

HALLIBURTON "HM" RETRIEVABLE PACKER

A hook wall type packer run on tubing in cased hole to provide a seal above the zone to be fractured or acidized for production improvement. Allows large volumes of fluid to be pumped through tool with minimum drop in pressure. Set by weight of tubing; released by picking up. Hydraulic slips prevent movement of packer up the hole. Can be set and reset for multiple treatments as many times as desired without coming out of the hole.



HALLIBURTON
SPECIAL TOOL SERVICES

HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

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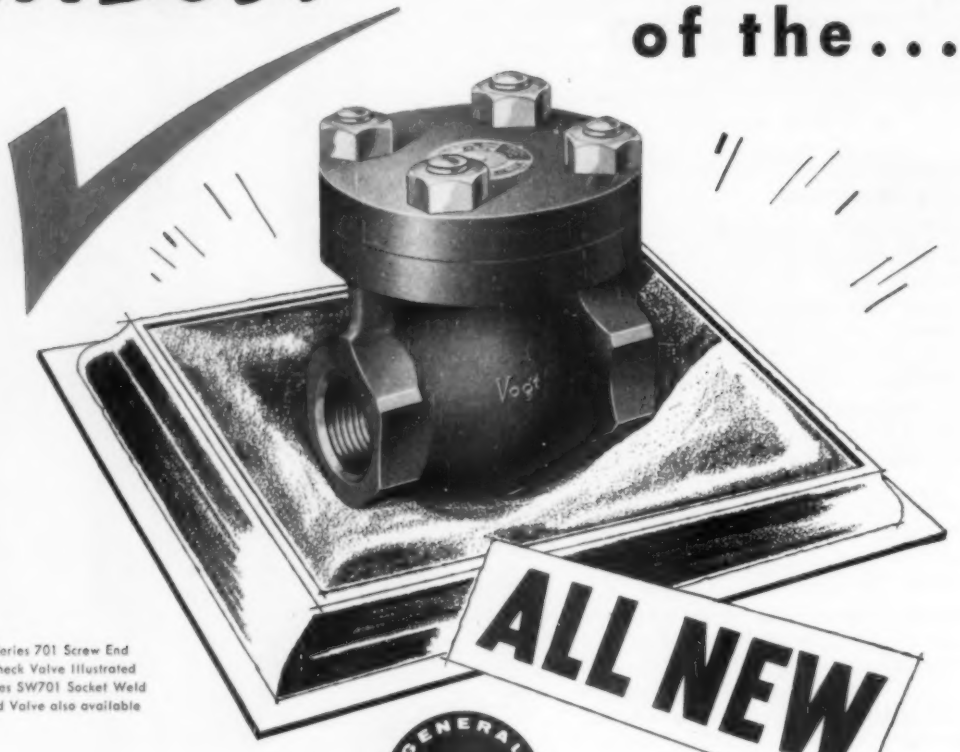

Series 701 Screw End Check Valve Illustrated
Series SW701 Socket Weld End Valve also available

GENERAL GP PURPOSE

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CHECK VALVES

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Vogt VALVES FITTINGS

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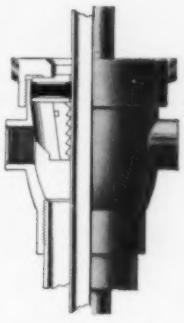
Rector

gives you the "Big Four" in Non-Flanged

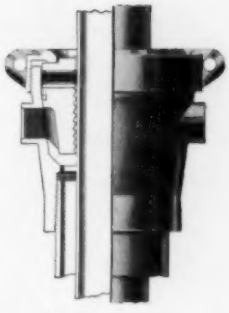
Casing and Tubing Heads

Rector Type "R" Casing Head

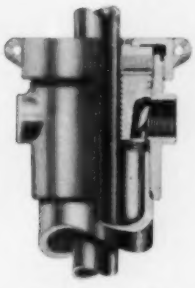


Rector Type "E" Tubing Head

Rated at 1000 Lbs. Working Pressure
2000 Lbs. Test Pressure



Rector Type "RT" Casing Head



Rector Type "R" Tubing Head

Rated at 2000 Lbs. Working Pressure
4000 Lbs. Test Pressure

Check these important features

SUSPENSION—Casing heads have case-hardened three-segment type *hinged* slips of ribbed construction to allow full flow to outlets. Tubing heads use same type of suspension or special threaded type or slip-type mandrel hanger for use with Kobe pump or dual string tubing installations.

SEAL—Both casing and tubing heads have an oil-resistant pack-off which is forced into sealing position by a split packing gland. Type "R" casing head gland is tightened by six stud bolts . . . Type "RT" casing head and tubing heads by a cap threaded to the body.

SIDE OUTLETS—Both casing and tubing heads are available with 2", 2½" or 3" threaded side outlets. Type "E" has 2" threaded side outlets only.

BOTTOM CONNECTIONS—Rector gives you a wide range of sizes. Casing heads have male or female threaded bottom connection. Type "R" is available through 13⅜", Type "RT" through 10¾". Type "R" tubing heads are available with male or female threaded bottom, 4½" through 7", also all flange sizes and series with standard API ring groove and bolting arrangement. Type "E" is available with female threaded bottom connection only.

Rector casing and tubing heads offer you the best value in Non-Flanged well head equipment. They are ideally suited for the widest possible range of producing conditions. Constructed of Alloy steel, they give long service at an amazingly low price.

Rector casing and tubing heads are available through your favorite supply store.
Or see your Rector representative.

SEE OUR EXHIBIT

MAY 14-23, 1959
Tulsa, Oklahoma

Rector

WELL EQUIPMENT COMPANY, INC.

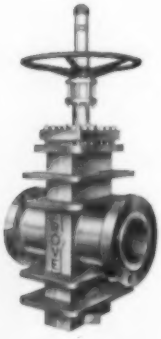
1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

HOUSTON PLANT: 2215 COMMERCE STREET

EXPORT REPRESENTATIVES: Continental-Emsco Co.; Mid-Continent Supply Co.; Oil Well Supply Division of United States Steel Corp.

Strapped with a barrel of trouble?

GROVE valves never require lubrication



Get rid of the load of lubrication with Grove Seal-O-Ring gate valves. Save the countless man hours, expensive supplies and equipment required to maintain ordinary valves. Grove valves work without lubricant or sealing compound. Tough, resilient Hycar "O" rings—in the valve seats—wipe the gate face clean of foreign matter which might cause sticking or distortion...seal bubble tight on both sides of the gate... There's no fear of valve failure because of forgotten lubricant or depleted sealing compound. And you eliminate the danger of contamination or meter fouling resulting from lubricant or sealing compound entering the line.

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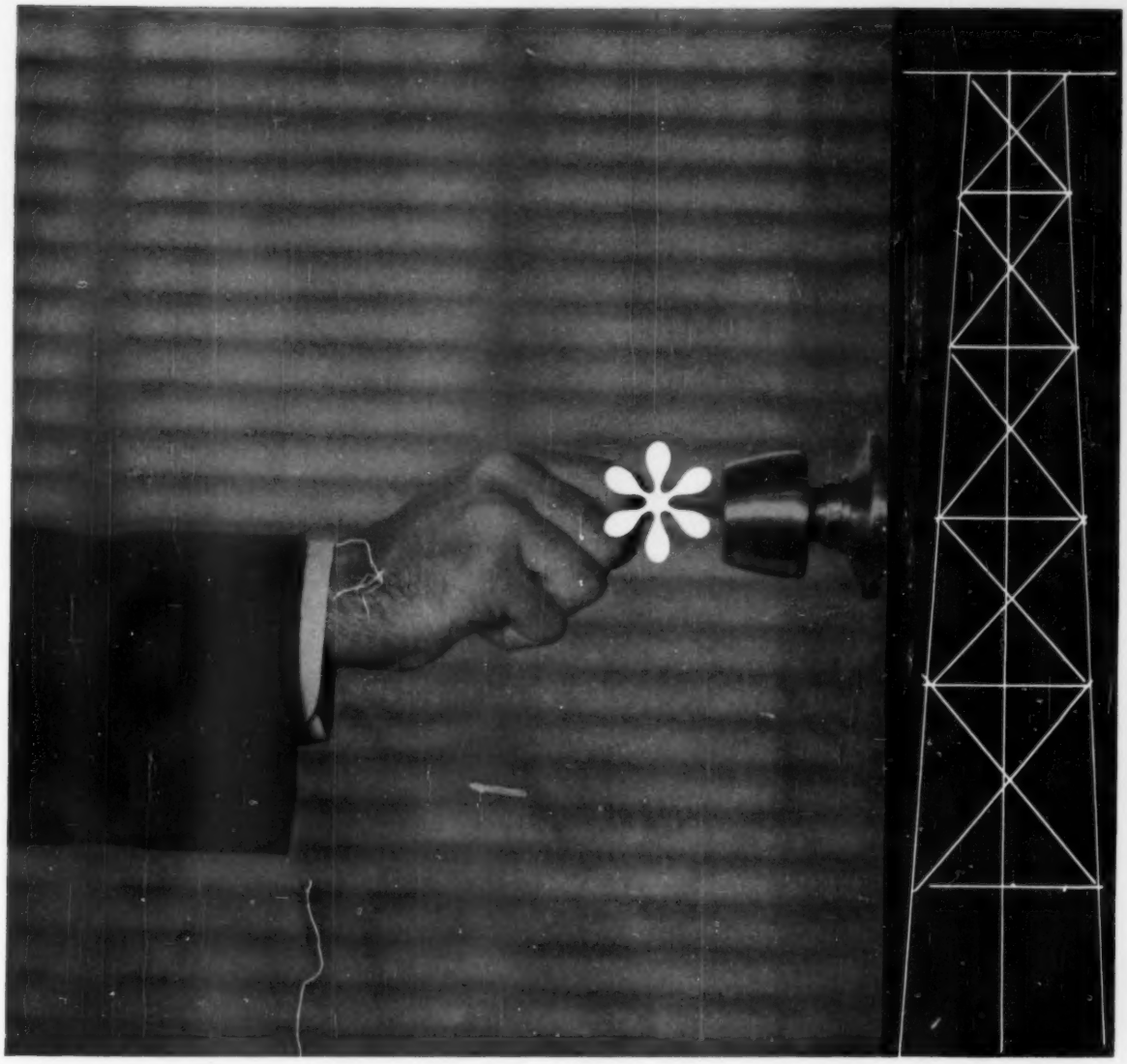

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another
TRETOLITE SERVICE
report

BEFORE KONTOL! *Here's what a tube bundle looked like in one of the heat exchangers of an Ohio refinery—after just 94 days of service. A* KONTOL *Protection Program has since trebled tube life, upped heat exchange efficiency by more than six million BTU's per hour!*

See our exhibit at the International Petroleum Exposition, Tulsa, May 14-23, and 5th World Petroleum Congress, New York, June 1-5.

KONTOL* CORROSION INHIBITOR TRIPLES TUBE-BUNDLE LIFE AT OHIO REFINERY

Also saves $96.00 per day on increased BTU's . . . The effectiveness of KONTOL* protection against corrosion and fouling in tube bundles was dramatically demonstrated in the heat exchange equipment of the crude unit at a large refinery in Ohio.

Since the inauguration of a regular KONTOL Corrosion Inhibitor program, the tube bundle life period has been increased by approximately 3 times the bundle life prior to the use of KONTOL.

KONTOL'S DETERGENT ACTION ADDS DOLLAR-BONUS TO OPERATION

The detergent action of KONTOL Corrosion Inhibitor provided a *plus* benefit for the refinery. A cleaner operation has resulted in the gain of an additional 6,000,000 BTU's per hour—or a savings of about $96.00 per day.

THERE'S A KONTOL PRODUCT FOR YOUR CORROSION PROBLEM

The KONTOL product used in this case was based on a careful study of the refinery's specific needs. The Tretolite Company developed and pioneered the application of organic corrosion inhibitors throughout the petroleum industry. No other organization has Tretolite's wealth of experience and know-how in the manufacture and use of these products. This background (Tretolite corrosion engineers, laboratory and research facilities) is always available to you—to help solve your particular corrosion problems. A call will bring you this service—at no obligation.

*KONTOL *is a registered trademark of Petrolite Corporation.*

BR-59-1

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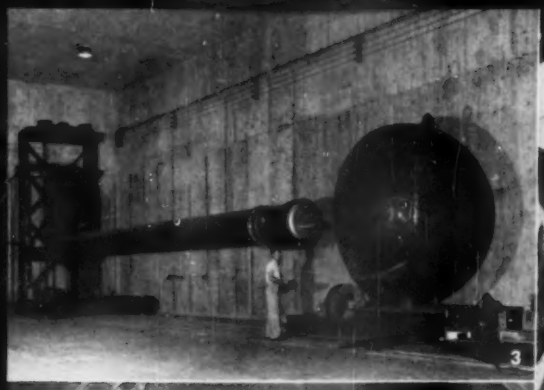

Craftsmanship Counts at CB&I . . .

Almost 70 years of specialization in the design, engineering, fabrication and erection of steel plate structures will build long and efficient performance life into your next CB&I-built storage or processing structure. Here's why:

CB&I Engineers From first contact with the customer through final testing, CB&I's general engineering staff supplies technical guidance to the CB&I team. Important coordination between fabricating, erection and testing of your structure is thus insured.

CB&I Fabricates The finest manufacturing facilities—including X-ray and stress relieving—backed by metallurgical laboratories and testing facilities second to none—are maintained in four strategically located and fully equipped fabricating plants.

CB&I Erects Skilled, responsible crews work with up-to-date equipment. Field X-ray and stress relieving equipment, backed by welding research laboratories, are an important part of their trade. Experience in a wide variety of metals, including stainless, nickel, aluminum and clad materials are also part of the service that has earned CB&I a *global* reputation for erecting on a *world-wide* basis.

These coordinated services are what you receive when you contract for a CB&I-built structure. CB&I customers have learned to expect and get top rated performance and maximum service life from CB&I *craftsmanship in steel.* Write our nearest office for details. Ask for the CB&I Bulletins on: *Special Plate Structures* and *CB&I Field Services.*

P73CB

1. 5-in. thick plate for reactor is fabricated at CB&I's Birmingham, Alabama plant.

2. Workman smooths seams on an assembled section.

3. X-ray machine for checking seam welds. Machines operating at 1,000,000 and 2,000,000 volts are used to completely inspect steel vessels as much as 10 inches thick.

4. 72-ton top section for reactor-regenerator is lowered into position under supervision of CB&I erection specialist.

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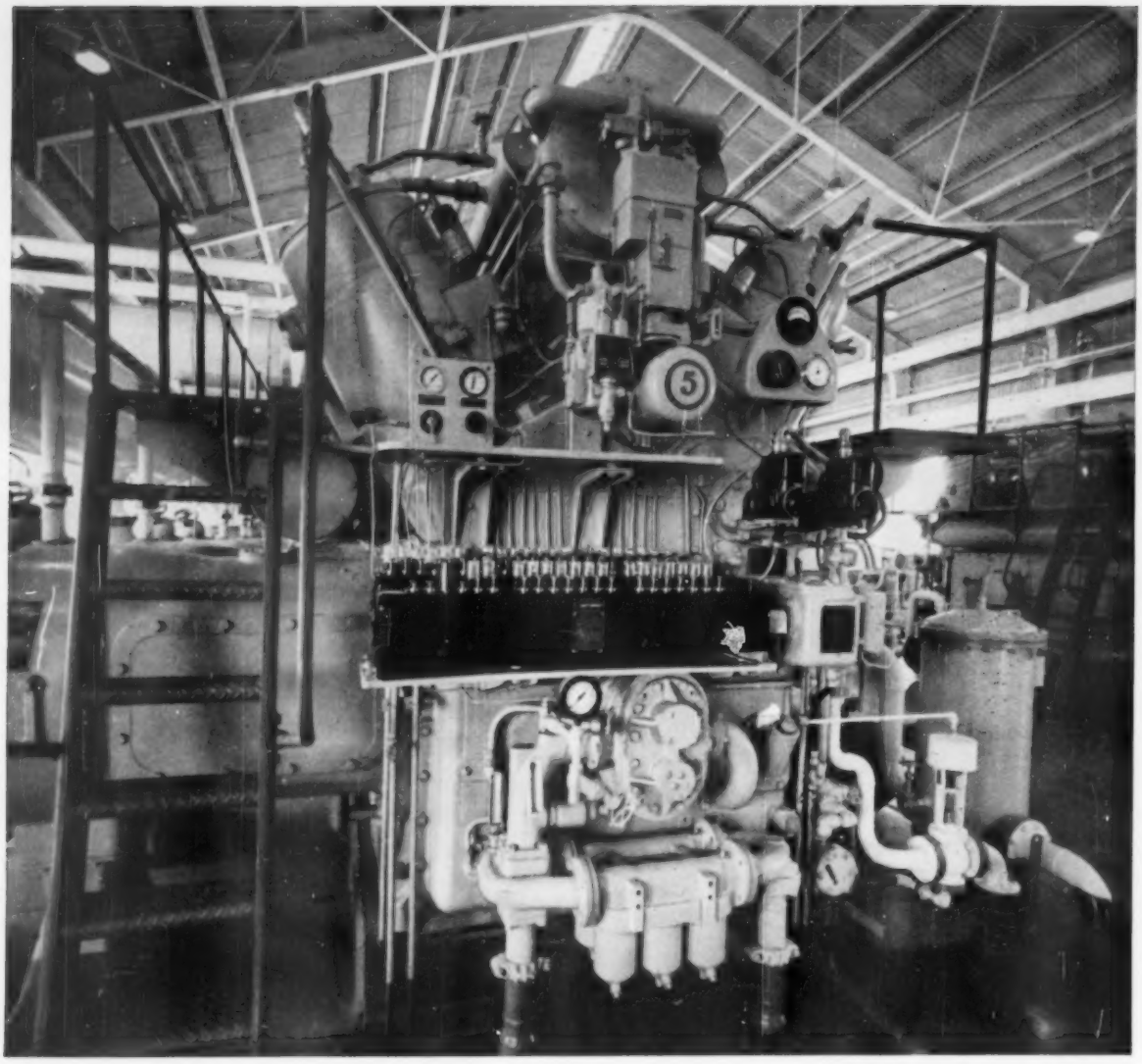

BENDIX MAGNETOS SPARK COOPER-BESSEMER ENGINES FOR EL PASO NATURAL GAS

Once again, Bendix* ignition equipment is proving its worth to the petroleum and natural gas industries. Shown here is a Bendix LAR magneto and Hi-V transformer coil installation at El Paso Natural Gas Company's Blanco Station in San Juan County, New Mexico. El Paso uses eight 1350 hp. Cooper-Bessemer gas compressors, all equipped with Bendix magnetos, at its mainline gas booster station.

Bendix LAR magnetos deliver dependable ignition at the lowest practicable cost. Even under the most adverse operating conditions, their reserve power ensures smooth engine performance. The Bendix LAR magneto and Hi-V transformer coil form a matched ignition system to handle rugged engine requirements.

LA magnetos now in service can easily be converted to the modern Bendix LAR type with conversion kits now available. They can be obtained from your Bendix ignition distributor or from the factory. For complete details, write SCINTILLA DIVISION OF BENDIX AVIATION CORPORATION, Sidney, New York.

*REG. TRADEMARK

Scintilla Division
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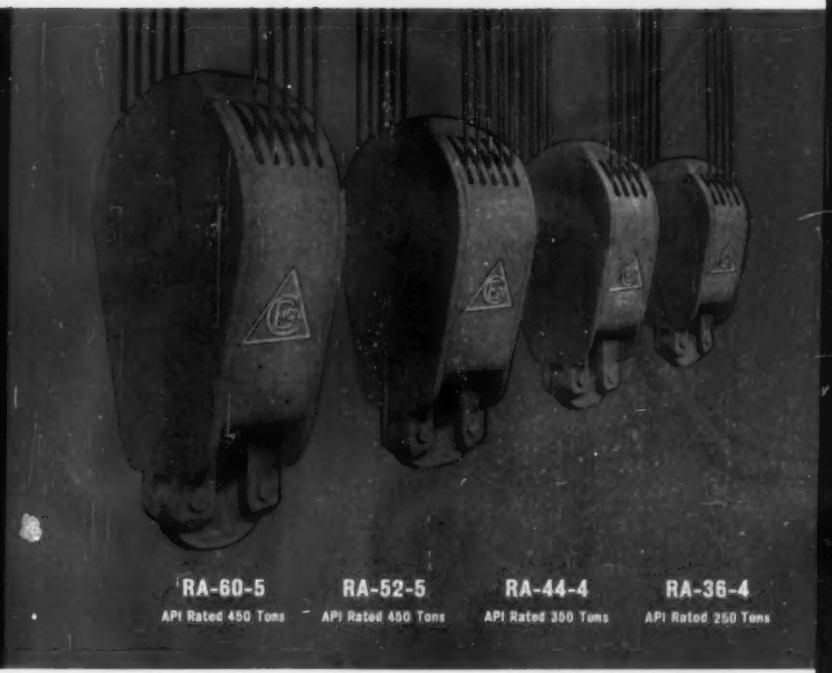
AVIATION CORPORATION

SPEED-UP ROUND TRIPS WITH CONTINENTAL-EMSCO TRAVELING BLOCKS

MA-60-6
API Rated
600 Tons



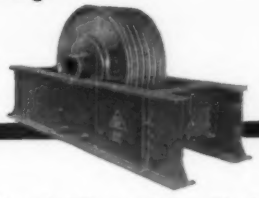
RA-60-5
API Rated 450 Tons

RA-52-5
API Rated 450 Tons

RA-44-4
API Rated 350 Tons

RA-36-4
API Rated 250 Tons

This larger MA block is designed for deepest drilling.



Continental-Emsco Crown Blocks

Continental-Emsco crown blocks are available to match the larger sizes of traveling blocks. Sheaves and bearings are interchangeable with these traveling blocks and ratings are according to API specifications.

Continental-Emsco traveling blocks fall straight and fast; trips are made faster and safer. Their straight, fast falling characteristics are the result of a low center of gravity and free running sheaves. "Slim-lined" to give greater operating clearance in the drilling masts, C-E blocks are rated according to API specifications.

Flame hardened, forged steel sheave rims reduce wire line wear. Rims can be regrooved thereby extending their service life. Lubrication cartridge can be inserted from either side, so complete lubrication can be from the most convenient side.

C-E blocks match existing hooks and swivels. A wide range of sizes makes it possible to equip all rigs from small portable units to those for the deepest drilling with C-E traveling blocks.

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MAY 14-23, 1959
Tulsa, Oklahoma

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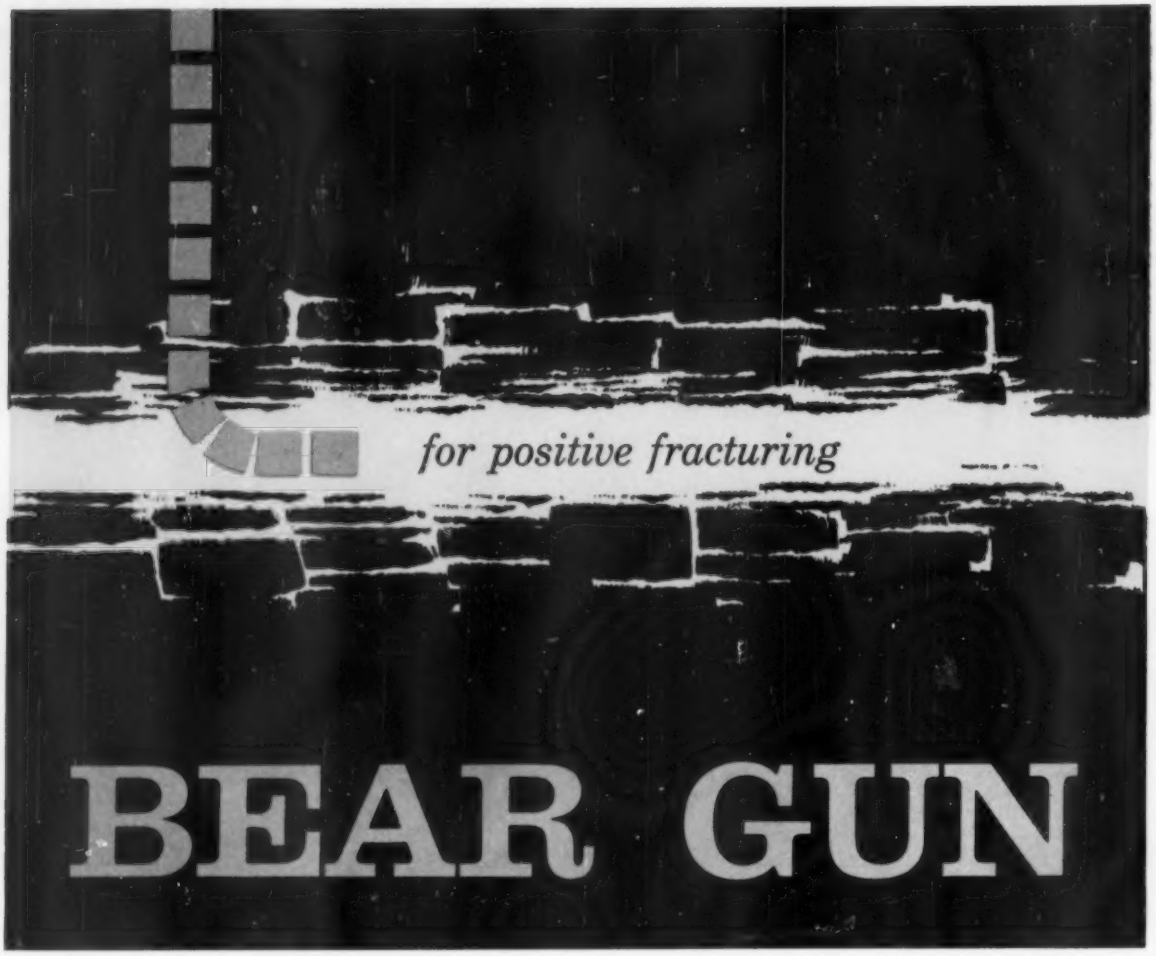

116 Barrels Per Day From A "Dry Hole"

Here's typical results one Oklahoma operator got with the Welex Bear Gun after cleaning out an abandoned well, previously perforated unsuccessfully with bullets. Fracturing with two shots from the Bear Gun turned the "dry hole" into a 116 barrels per day producer.

This is just one of hundreds of wells which have been fractured successfully by the Welex Bear Gun—often after other types of fracturing fail.

Utilizing the projectile-type method of fracturing, the Welex Bear Gun propels its missile at about 4,000 feet per second straight down the hole. At the desired depth a deflector turns the projectile 90 degrees into the formation. The missile penetrates the casing, without casing damage, and drives several feet through the cement deep into the formation, resulting in extensive and positive fracturing and fissuring every time.

Developed by Welex, the company that originated jet perforating, the Bear Gun is the solution to your production problem in any formation. For more information, contact your Welex representative.

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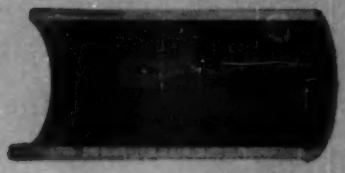
TUBOSCOPE CUTS PRODUCTION COSTS

NEW

SONOSCOPE INSPECTION OF USED TUBING



Detects Even Minute Corrosion Pitting

Gives Quantitative Results

100% Coverage of Tubing Wall

Sonoscope® inspection is the most accurate method of locating pitting, corrosion, and other faults on both inside and outside surfaces of used tubing. Tubing need not be cleaned for inspection. Inspection is performed at your well site. From the Sonoscope log, tubing defects can be more accurately evaluated than previously possible by non-destructive methods. Re-use tubing with complete confidence. Call TUBOSCOPE

Tuboscope COMPANY

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Write for additional information, Dept. 118, P. O. Box 808, Houston 1, Texas

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Experience... the secret of every success story, has made BS&B a world leader in oilfield equipment design and manufacture. Sixty-six years of service to the oil industry has provided BS&B with the vital technical experience essential to the design and manufacture of equipment which operates efficiently under any combination of lease conditions.

If you are re-equipping a lease or planning a new installation, put the experience and "know-how" of BS&B to work for you. Get in touch with your BS&B Representative, or write to...

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JEFFERSON CHEMICAL'S
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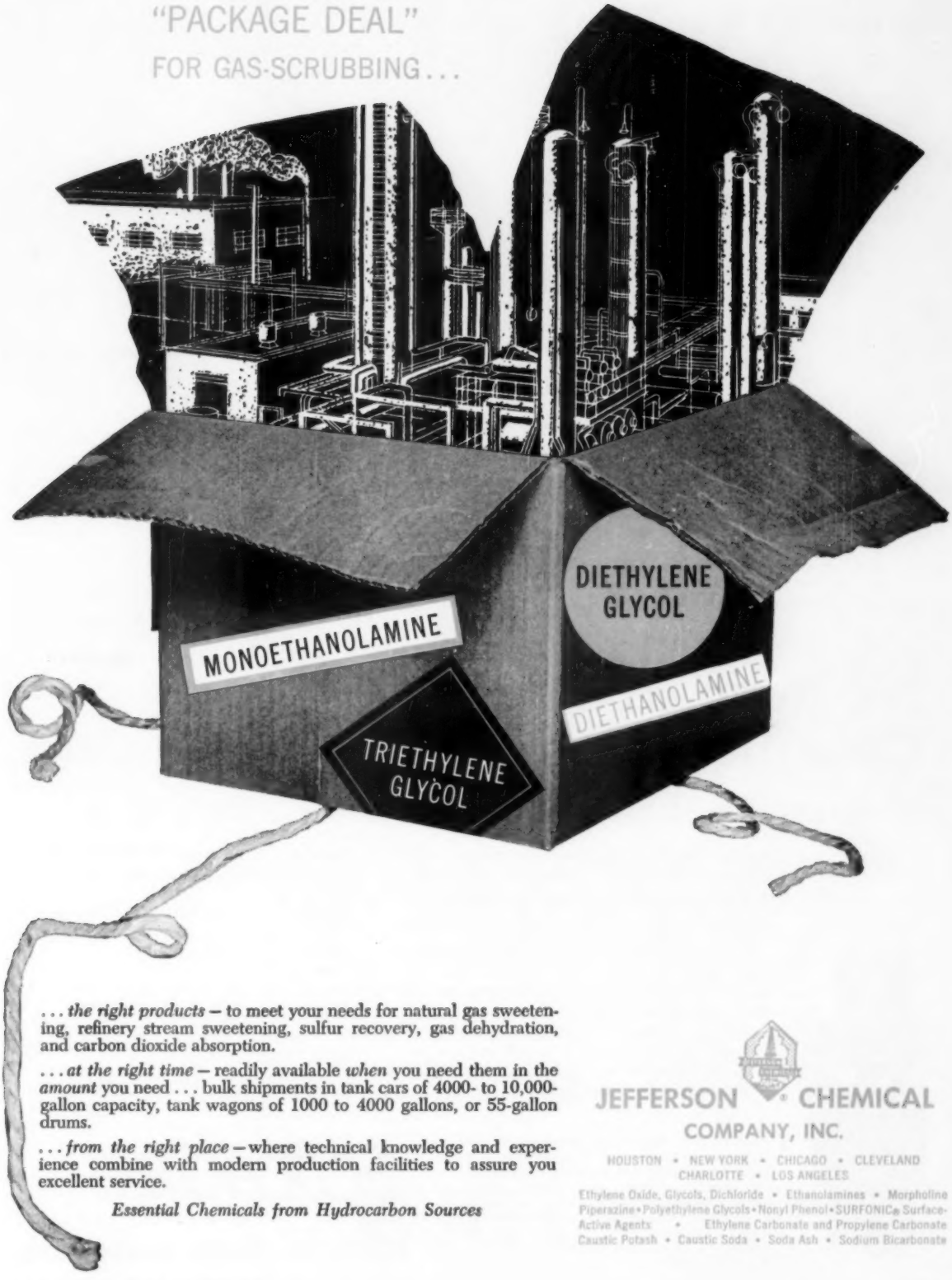
FOR GAS-SCRUBBING...



... *the right products* – to meet your needs for natural gas sweetening, refinery stream sweetening, sulfur recovery, gas dehydration, and carbon dioxide absorption.

... *at the right time* – readily available *when* you need them in the *amount* you need ... bulk shipments in tank cars of 4000- to 10,000-gallon capacity, tank wagons of 1000 to 4000 gallons, or 55-gallon drums.

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unmatched stability in a "dry" flow meter

FOXBORO T/37 DIAPHRAGM METER

- Ranges: 20", 50", 100", 200" standard (Optional: adjustment for full scale ranges between 25" and 200"; compound and expanded ranges.)
- Forged construction in Type 316 stainless or carbon steel
- Round or rectangular case

No zero drift... Complete overrange protection

Mercuryless flow measurement over a wide range of differential pressures — at static pressures up to 2000 psi (2500 psi optional). That's the story behind Foxboro's unique Type 37 Diaphragm Flow Meter.

No matter how often you check its accuracy you'll find no need to reset zero or span. Four vital construction features assure this remarkable stability:

1. Unique nesting diaphragm element of Type 316 S.S. which responds to changes in pressure with unmatched sensitivity yet cannot be damaged by overrange . . .
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3. Bi-metallic temperature compensator which precisely counteracts changing volume of the filling fluid . . .
4. Heavy Ni-span C alloy range springs which are unaffected by changes in line temperature . . .

Get full details on this high utility, completely dependable dry flow meter. Write for Bulletin 7-15A. **The Foxboro Company, 604 Neponset Ave., Foxboro, Mass.**

Type 316 S.S. diaphragm elements, in both high and low pressure chambers, provide greatest linearity and freedom from hysteresis. Nesting design, and integral spacer rings provide positive overrange protection. Bi-metallic temperature compensator (E) adjusts the capacity of the diaphragm assembly to counteract changing volume of the filling fluid.

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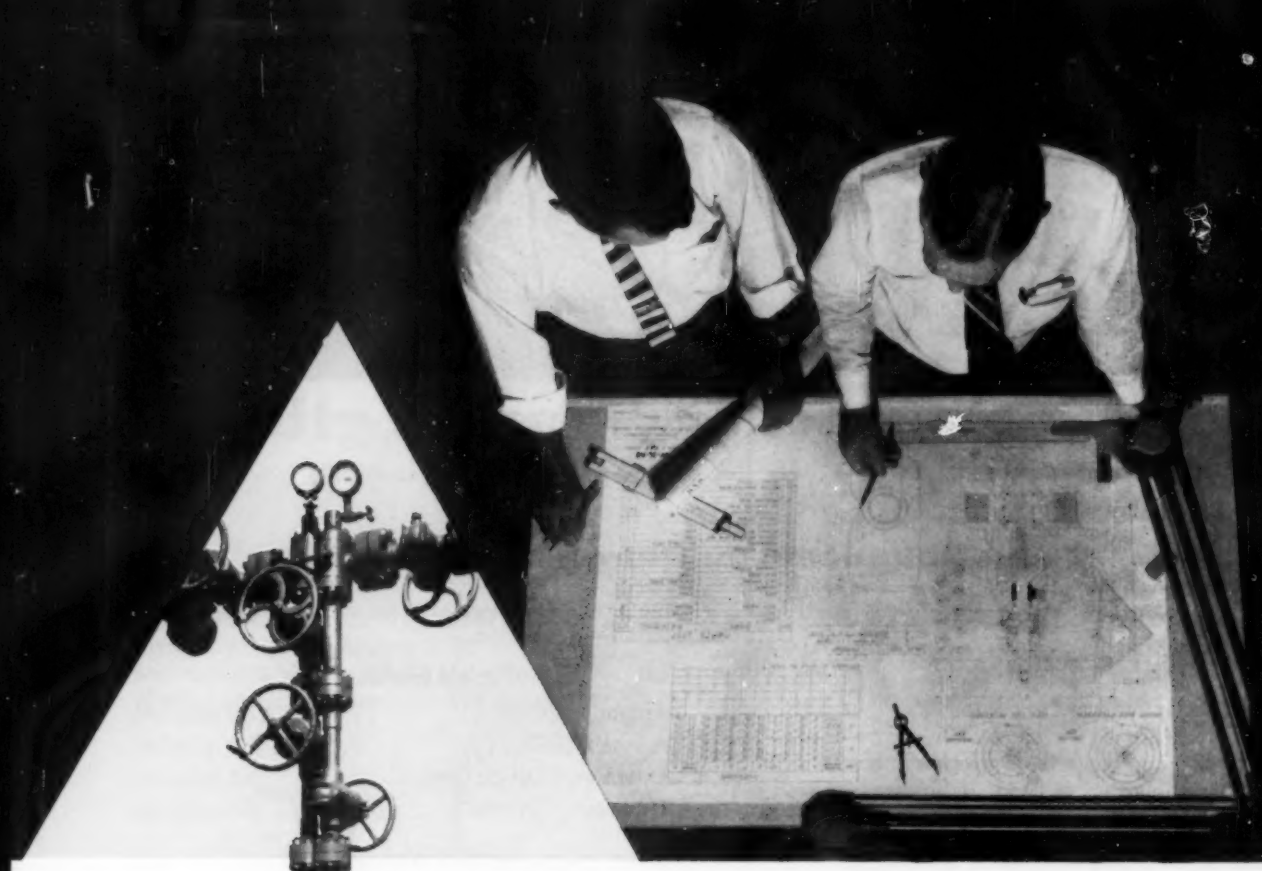
first in flow metering



W-K-M *Creative Engineering* sets the industry standard for Through-Conduit Gate Valves

W-K-M
Recessed Body Valves
for Dual Completion Christmas Trees

These recessed body valves illustrate how W-K-M's creative engineering solves your problems. The recessed body was achieved without impairing the efficiency of the typical W-K-M design. These valves give you the benefits of W-K-M's parallel expanding gates, controlled force seating, free flow through the valve without turbulence or pressure drop, and can be completely overhauled in the line.

Sizes: 1½", 1¾", 2", 2½" and 3". Working pressures, 2000 pounds to 5000 pounds.

WRITE FOR CATALOG 200

The creative engineering behind W-K-M Through-Conduit Gate Valves sets industry standards for design . . . dependability . . . easy operation . . . long life and low maintenance costs. Quality of workmanship and material is rarely duplicated, never surpassed. In the field, service is prompt, skilled and helpful.

ON HAND. The most used sizes of W-K-M Gate Valves are carried by supply stores everywhere. Special sizes and special designs are produced as you need them.

W-K-M

DIVISION OF ACF INDUSTRIES
INCORPORATED
P. O. BOX 2117, HOUSTON, TEXAS

5909

A look at today . . . and a glimpse

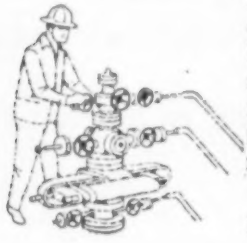
Armour Chemicals for Petroleum Production

Where they work today

Numerous applications for Armour Chemicals exist from the time a well is "spudded in" to the time crude oil is delivered to the refinery. Typically, these chemicals are used in mud drilling, give outstanding corrosion and bacterial protection in producing wells or fields under water flood, and insure corrosion protection in pipelines and terminal storage facilities.

In producing oil wells

Salts made from the Duomeens® (Armour's trade name for diamines), have gained wide acceptance in the petroleum industry as down-the-hole corrosion inhibitors. These oil soluble, cationic, hydrophobic salts form a tough molecular film on steel and markedly reduce corrosion.



Corrosion rates of 0.0014 IPY at a cost of 9 mils/bbl. are not unusual (based on 2 qts./100 bbls. producing fluid). Some of the salts made from Armour's Duomeens are shown at the bottom of the page.

For complete technical data, check "A" in the coupon.

For injection water treatment

Effective corrosion and bacterial protection in water flood operations are provided by Armour polar organic compounds at concentrations as low as 7 to 8 ppm (based on 100% activity). Armacs®, Arquads®, Duomeens and Duomeen salts are successfully being used for this application.

Typical treatment cost

Arquad T-2C-50	1.2 mils/bbl.
Armac CD-50	1.0 mils/bbl.
Duomeen CDA-50	1.1 mils/bbl.
Duomeen TDO-50	0.8 mils/bbl.

There is an effective Armour Chemical for every water system. The brine content of the water is one of the major factors determining the product to be recommended for use.

For example, high corrosion rates in a salt water disposal system in Western Kansas were greatly reduced by using only 6 ppm of Duomeen TDO, one of Armour's oil soluble, water dispersible inhibitors.

Armour's technical staff is continuing to field test many chemicals that will increase injection rates. Ethomeen® C/15, for example, is increasing injectivity at no increase in injection pressures in the Oklahoma and Pennsylvania fields.

Check "B" in the coupon for more information about Armour Chemicals applicable to water flood operations.

In product lines, transportation equipment and storage tanks

Pipeliners in many parts of the country are now using the Armeens®, Duomeens, or their salts, to protect pipelines from the costly effects of corrosion. By using these Armour Chemicals, operators are doubling —even tripling—life expectancy of pipelines.

Duomeen T dioleate

$$RNH(CH_2)_3NH_2 + 2C_{17}H_{33}COOH \longrightarrow \left[RNH(CH_2)_3NH_3\right]^{++}\left[OOCH_{33}C_{17}\right]^{-}_2$$

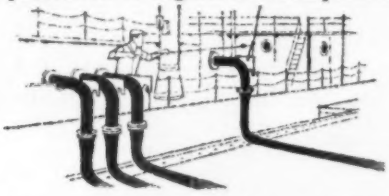
Duomeen T Di-Napthanate

$$RNH(CH_2)_3NH_2 + 2 \longrightarrow \left[RNH(CH_2)_3NH_3\right]^{++}$$

# of tomorrow

from Armour Chemical

Corrosion inhibition is achieved in gas line compressors by adding Arquad T-2C to cooling systems and radiators. Armac CD/50 also gives efficient, economical protection to engines and compressors.



The Duomeens are being used successfully to combat corrosion in refined product lines. Tankers are also being protected by these strongly cationic corrosion inhibiting chemicals.

More information regarding Armour Chemicals for these applications is available. Check "C" in the coupon.

Where Armour Chemicals for oil production will work tomorrow

Drilling muds. A relatively new Armour Chemical—Ethomeen S/12—is currently being tested as an emulsifier in drilling muds.

Acidizing and fracturing additives. It has been discovered that certain Arquads will form acid emulsions. The Arquads are used as emulsifiers in acid kerosene jets. They also control silicide swelling. In thickened oils they increase sand suspension. Test results show that extra corrosion protection for trucks and the tubing can be provided by the Arquads.

Water coning. Water production from coned wells has been reduced in a field test in Southern Louisiana by injecting two Armour surfactants in a water system. The treatment, based on laboratory work conducted by Dr. Alan S. Michaels of M.I.T. is also being field tested in other sections of the country to improve oil production.

Test and evaluate Armour's Chemicals for oil production. Our experienced oil chemists will help you determine the right chemical for your special problem. Send coupon—or call—Armour today!

NEWS NOTES

Houston. A new technique, showing the presence of hydrocarbons in thin sand beds and shaly sands normally by-passed by standard logging techniques, was discussed in a paper titled "Reversed Wetting Logging" at the recent S.P.E. meeting. The technique utilizes the hydrophobic-cationic characteristics of surfactants such as Armac® CD-50.

•

Tulsa. The Arquads®, quaternary ammonium chlorides, have now been completely cleared of being catalyst contaminants by at least three major refiners in the Southwest. There had been a tendency to class these excellent bactericides-corrosion inhibitors with chlorinated solvents.

•

Southeast Oklahoma. A new series of ethoxylated quaternary ammonium chlorides—the Ethoquads®—are showing promise for increasing injectivity here in field tests.

•

Hobbs, New Mexico. Clarification of injection water for secondary oil recovery is now being obtained through the addition of 0.1 pound of Arquad per ton of solids to be flocculated.

ARMOUR CHEMICAL DIVISION

Leader In Progressive Fatty Acid Chemistry

© Armour and Company

Increase oil production with Armour Chemicals

Check here for more information on your field of interest. ☐ A ☐ B ☐ C OGJ-4-59

Send samples and more information for this application:

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(Sample offer limited to North American Continent)

Armour Chemical Division • 1355 W. 31st St. • Chicago 9, Ill.

DIG FAST... WORK CLOSE... CUT COSTS

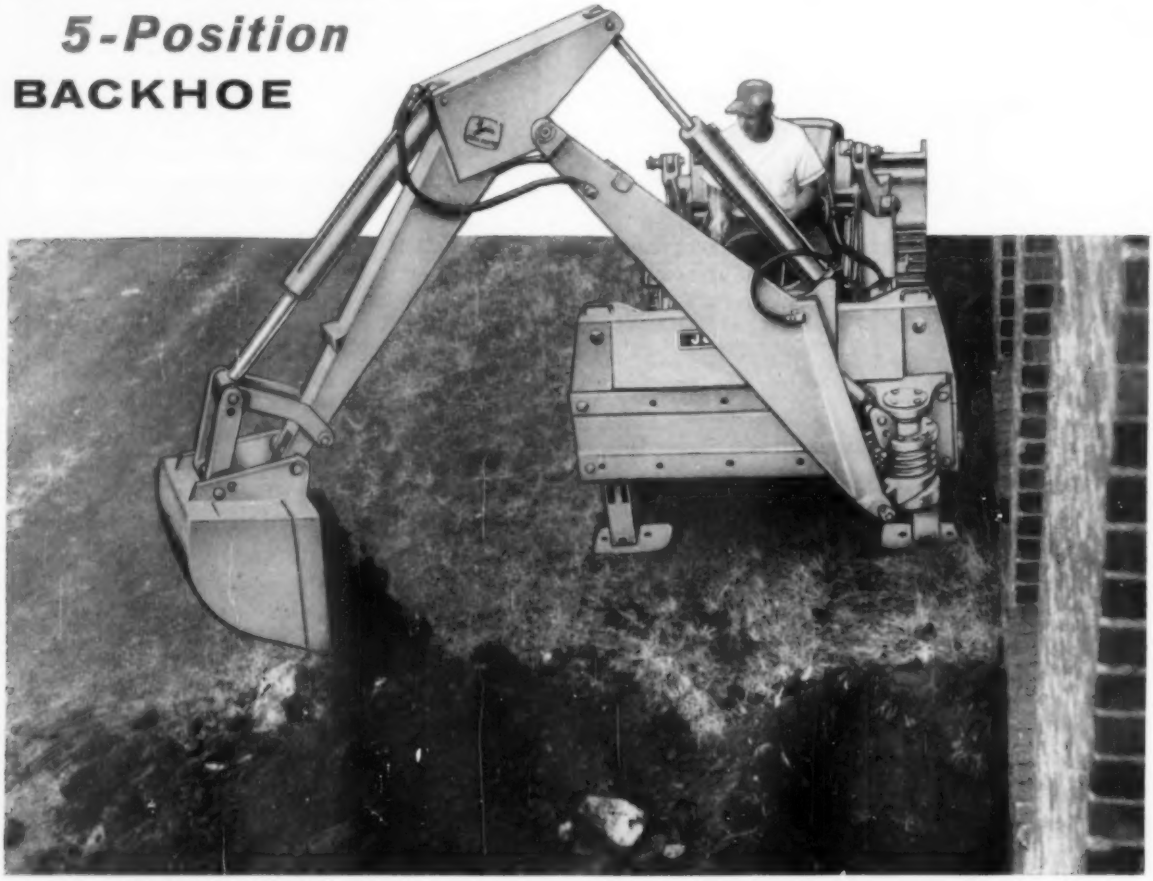
WITH A

JOHN DEERE *5-Position* BACKHOE

This new 5-position backhoe outfit takes full advantage of the increased engine horsepower built into every John Deere "440" unit, gasoline or Diesel. There's plenty of crowd pressure and bucket rollback to make fast work of digging in hard or frozen soils. And to speed work further, all movements of boom, dipper stick and bucket are operated by simple, 2-lever control.

Mounting the boom left or right for flush digging is just a matter of minutes for one man, using only a wrench. Boom cylinder and mount *slide* along the pad to any of five positions, moved by the boom's own hydraulic power. Mounted left or right, boom and dipper stick fold sideways against frame to make a compact, well balanced transport unit. Entire assembly can be removed from tractor in five minutes.

This is the kind of modern, efficient unit that cuts costs. Let your John Deere Industrial Dealer prove it with a demonstration.



Basics on the John Deere 51 Backhoe:

- Boom travel—180 degrees • Ground level reach—20 feet, 9 inches
- Effective dumping height—11 feet • Maximum working depth—13 feet, 6 inches • Write Dept. 527 for detailed literature.

JOHN DEERE Industrial Tractors and Equipment

JOHN DEERE INDUSTRIAL DIVISION • MOLINE, ILLINOIS

MEMO TO PIPELINERS:
If you are really interested in the newest and most advanced method of cleaning gas, Ask Peerless about these installations.
PROVEN PEERLESS SCRUBOSPHERES FEATURE
• Newest Design
• Lower Initial Cost
• Cleaner Gas
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• Wide Customer Acceptance
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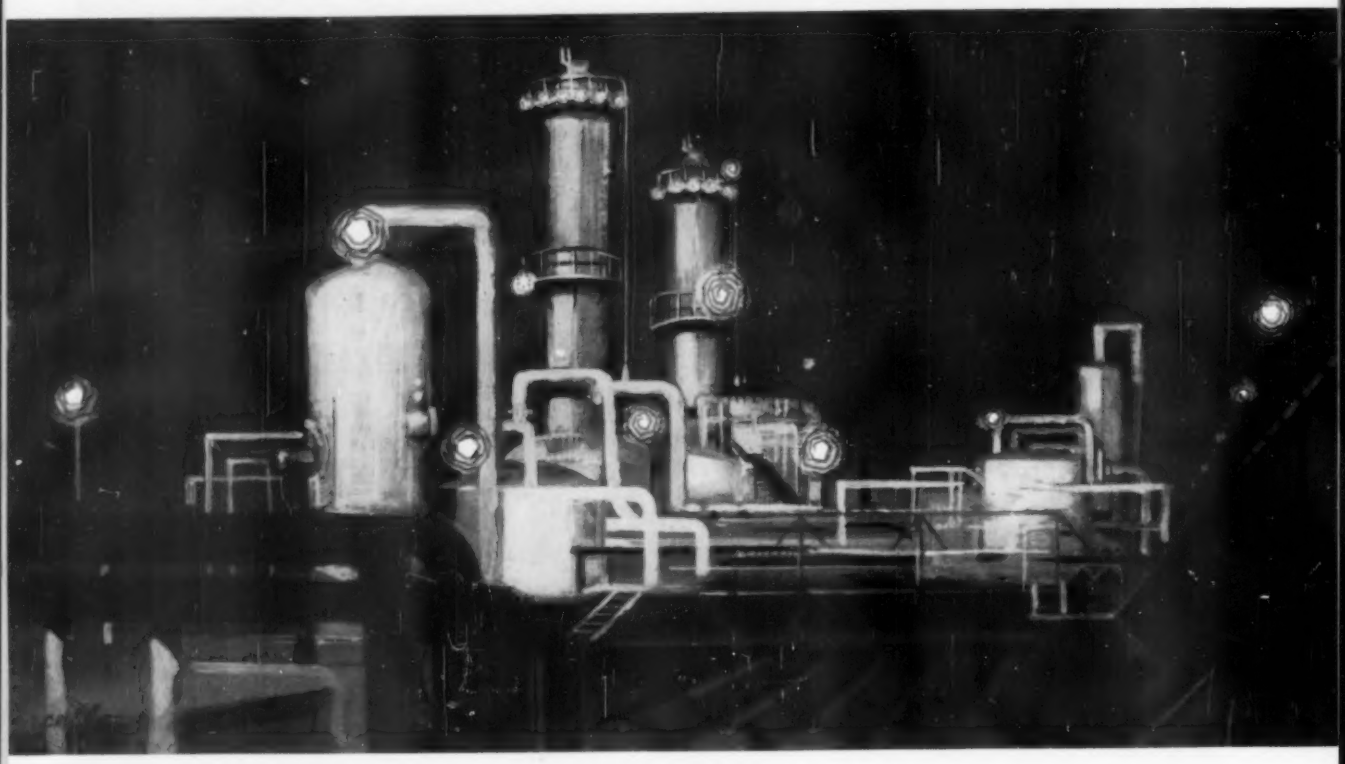
21,000
OVER 20,000 SEPARATORS and SCRUBBERS IN SERVICE

A refinery never sleeps

Twenty-four hours a day, a refinery is in operation. Its hundreds of miles of tubular products are constantly subjected to high temperatures and tremendous pressures. In order to survive under conditions like these, the tube must be hand-picked for the job. And, that's where National Tube comes in. If you need advice in refinery tube selections, get in touch with National Tube.



Our experience in this field comes from more than 60 years of gathering information for the solution of refinery tube problems. And, we've used this data to develop 24 different seamless steel tube analyses—each one the answer to a specific set of refinery conditions. Other chemical compositions are also available in tubular products, and a wide variety of high temperature problems are under study.

National Tube's Mill Service Force, available for field consultation, will be happy to help you find the right alloy, at the right price, to meet your needs. Write to National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and National are registered trademarks

Here are National Tube's two dozen different tube analyses:

Carbon	5 Cr, ½ Mo	17 Cr
Carbon ½ Mo	5 Cr, ½ Mo, 1¼ Si	18-8
1 Cr, ½ Mo	7 Cr, ½ Mo	18-8 Ti
1¼ Cr, ½ Mo	8 Cr, ½ Mo	18-8 Cb
2 Cr, ½ Mo	8 Cr, 1 Mo	18-8 Mo
2¼ Cr, 1 Mo	9 Cr, 1 Mo	25-20
2¼ Cr, ½ Mo, ¾ Si	12 Cr	3½ Ni
3 Cr, 1 Mo	12 Cr, Al	5 Ni

"The world's largest and most experienced manufacturer of tubular products"

USS National Tube Division of United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
United States Steel Supply Division • United States Steel Export Company, New York

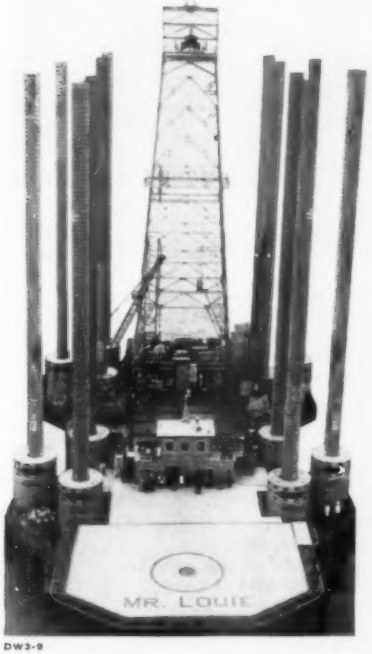
On 23,400-foot well . . .

MID-CONTINENT RIG HANDLED HEAVY LOADS WITH EASE

23,400 feet drilled . . . 660,000-pound hook loads handled . . . with completely trouble-free drawworks operation! That is the record of the Mid-Continent U-1220-EB Electra-Flow Drawworks on Great Western Drilling Company's Rig 44 in Pecos County, Texas.

During the drilling operation, Rig 44 set 15,849 feet of 9⅝" casing—believed to be the longest string of this size ever run. This casing string had an effective weight of 660,000 pounds, a load which the drawworks handled easily, prior to cementing.

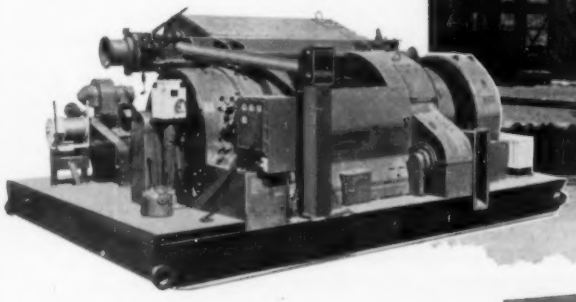
For complete information about the U-1220-EB . . . or any Mid- Continent drawworks, contact your nearest Mid-Continent representative.



DW3-9

"MR. LOUIE" FEATURES U-1220-EB

Also the choice of Universal Drilling Co., a Mid-Continent U-1220-EB Drawworks was selected for their new self-elevated offshore drilling platform "Mr. Louie," recently christened at New Orleans.



See Mid-Continent's Exhibit at the Tulsa Oil Show, May 14-23

MID-CONTINENT SUPPLY CO.

MID-CONTINENT BUILDING • FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

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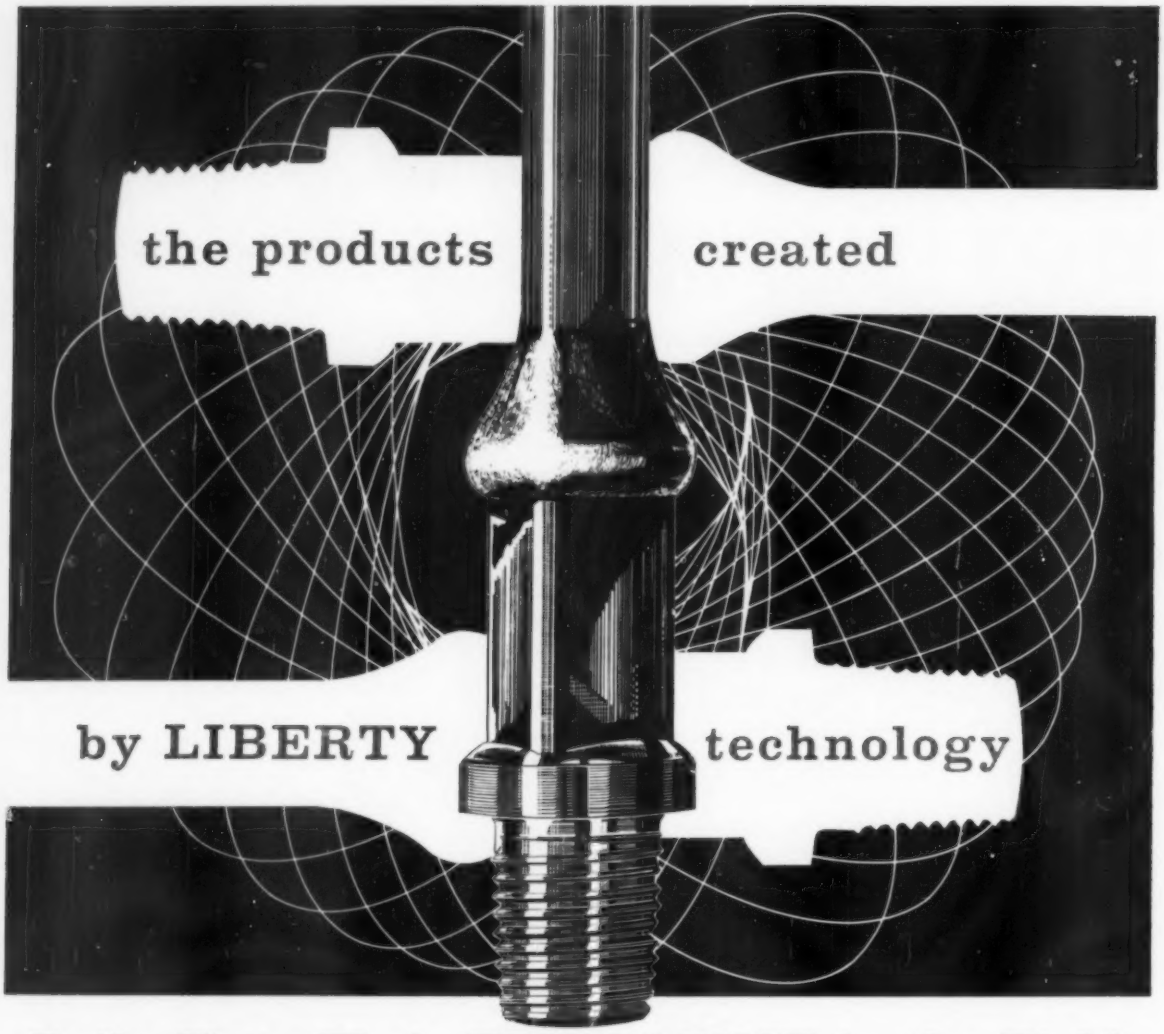

Daily Show Their EXCELLENCE in the Field

Save 10% to 33⅓% on pumping from low fluid-volume wells to 5,000 feet, with the LIBERTY ½-INCH SUCKER ROD–the newest product of LIBERTY technology.

To get complete information on the LIBERTY ½-INCH SUCKER ROD, send today for technical information.

All LIBERTY products are sold only in Supply Stores, through the LIBERTY SERVICE NETWORK.

There are many reasons for the excellence of LIBERTY SUCKER RODS and PUMPING UNITS but there is only one final proof: the performance which LIBERTY products give in day after day of hard field use.

In this way, LIBERTY SUCKER RODS and PUMPING UNITS have been serving the oil production industry for over 40 years, in every kind of pumping condition.

LIBERTY Field Representatives bring the same quality of excellence, in their training and experience, to assist you in designing installations for maximum efficiency in your pumping operations.

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ATLAS PIPE INC. IS AN ORGANIZATION OF
250 PEOPLE DEVOTED TO SELLING AND SERVICING
TUBULAR GOODS FOR THE PETROLEUM INDUSTRY

Here's how you can slash Pipeline Operating Costs with a Digital Telemetering System

Compare these facts on communication line costs of a digital telemetering system with those of typical analog telemetering systems and you realize that first-cost becomes an item of minor importance.

FACT 1 Analog systems require additional transmission lines when there are more than 15-20 information points.

FACT 2 A digital system can handle a virtually unlimited number of information points with a single telegraph-grade line.

FACT 3 Continuous analog signals tie up entire lines while digital systems give regular hourly reports (plus automatic alarm signals at any time) on a standard Teleprinter machine. This permits use of line for ordinary Teleprinter communication during all but a few minutes of every hour . . . an extremely worthwhile extra economy.

FACT 4 A digital system utilizing Norwood Controls ElectroSyn servos and Series 2100 encoders, requires only telegraph-grade lines. The output of the ElectroSyn encoder is 3-digit Teleprinter code which can be transmitted without costly conversion equipment.

Typical 25 Year SAVING $1,179,000

And we have the figures to prove it . . . thorough analyses of typical analog vs. digital communication costs. We would welcome the opportunity to discuss them with you.

ADDITIONAL PROFITS are to be gained from increased throughput due to greater reporting accuracy of a digital system which results in lower safety margin requirements.

AND . . . because digital system reliability keeps maintenance costs extremely low, this tremendous annual saving becomes almost pure profit as soon as first-cost has been recovered.

NORWOOD CONTROLS

For full explanation of advantages of digital telemetering systems utilizing ElectroSyn equipment, write for ElectroSyn Bulletin B258 — Norwood Controls Unit, Detroit Controls Division, 942-A Washington Street, Norwood, Mass.

AMERICAN-Standard
DETROIT CONTROLS DIVISION

Electrolytic test of "33" coated WECO Union —During the test the union was made-up and broken-out more than 100 times with a hammer, without destroying the electrolytic protection.

CORROSION RESISTANCE!

Unretouched photos of unions subjected to an offshore water splash test for several months. Notice the protection afforded by the "33" coating.

COATED

UNCOATED

U-2-59

NOW... Any WECO Union Available Fully Insulated

WECO UNIONS in any size or pressure rating are now available, fully insulated, at a very nominal additional cost. Our amazing new "33" coating, applied by special process, internally and externally, to both subs and wing nut provides high resistance to electrolytic action. Completely coated, there is no conductive metal-to-metal contact between any parts of the union.

"33" coating is tough and flexible . . . fully tested in the laboratory and field. WECO Unions with "33" coating have been made-up and broken-out hundreds of times without destroying electrolytic protection through the union.

In addition to its electrolytic resistance, "33" coating protects against the corrosive action of line fluids, external vapors and atmospheric conditions in a multitude of services. WECO UNIONS with "33" coating are ideal for offshore installations, refineries, fuel storage systems and many other applications requiring internal as well as external corrosion protection.

See your WECO representative or visit your supply store for WECO Unions with "33" coating to protect against electrolytic action and corrosion. To specify WECO UNIONS with the "33" coating, simply add "33" to the figure number of the WECO Unions you want.

WECO

WELL EQUIPMENT MFG. CORP.
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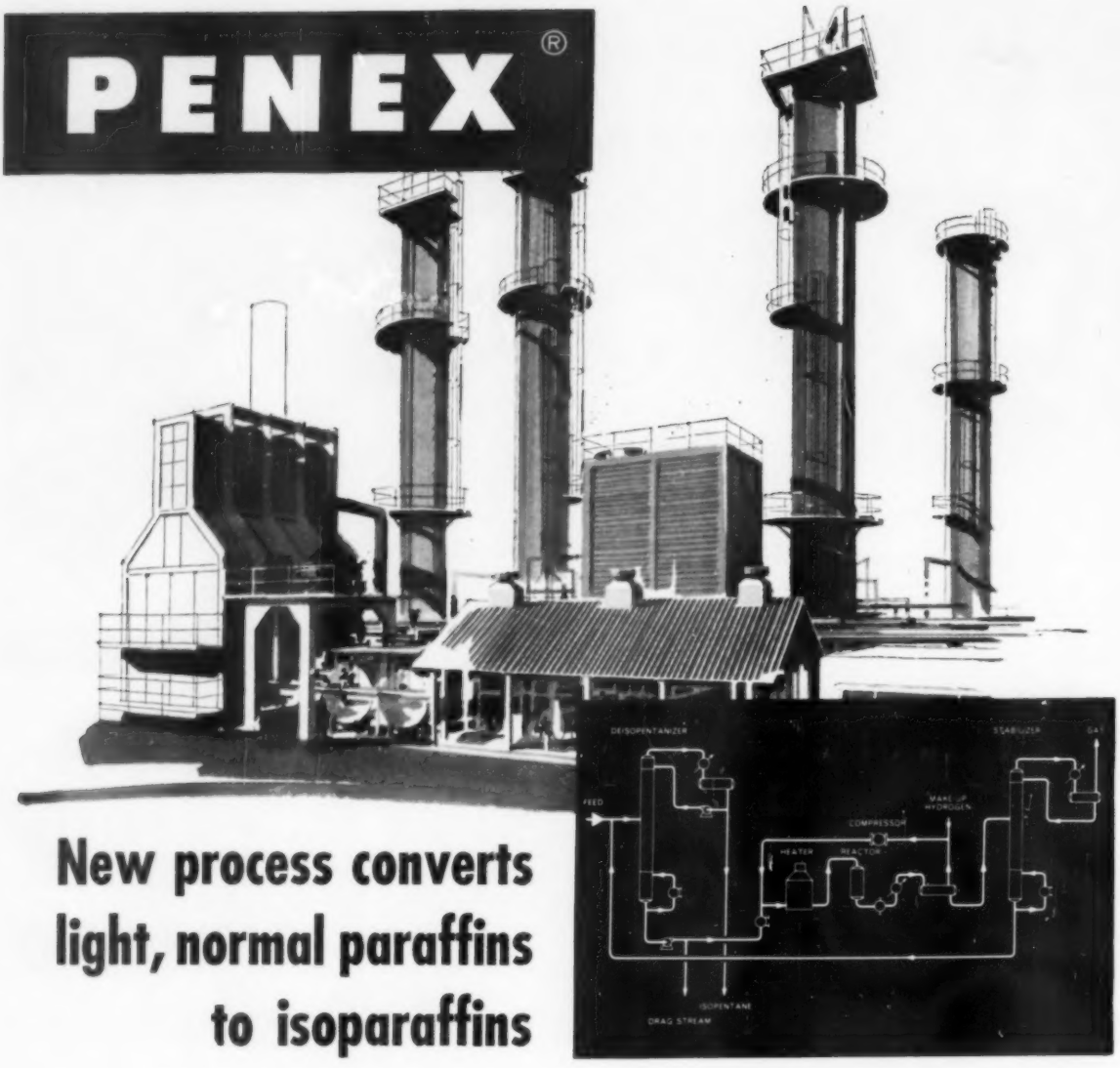
PENEX®



New process converts light, normal paraffins to isoparaffins

Here is a process which for the first time enables the refiner to economically upgrade pentane and hexane fractions, thus producing a high octane product with improved burning qualities, without plug-fouling and pre-ignition, with better sensitivity and better lead susceptibility.

The Penex process is economical in installation, operation and maintenance. Regeneration is not required, thus reducing capital investment, simplifying operation and reducing maintenance. Catalyst and reaction products are non-corrosive so lower cost carbon steel construction can be used.

Penex has an additional advantage when used with a reforming process such as Platforming®. Make-up hydrogen used in Penex processing is derived from the Platforming net high pressure separator gas. Hydrogen is consumed in insignificant quantities. This combination of processes also gives a considerable yield advantage at the same octane number.

Many other UOP processes are available to the refiner who is seeking ways to improve his operating efficiency and manufacture the kind of products that will bring him maximum market and economic benefits. These processes are available to all refiners. They are described in an informative fully illustrated booklet, "UOP Processes and Products," which will be furnished on request. Write for your copy today. Address:

UNIVERSAL OIL PRODUCTS COMPANY

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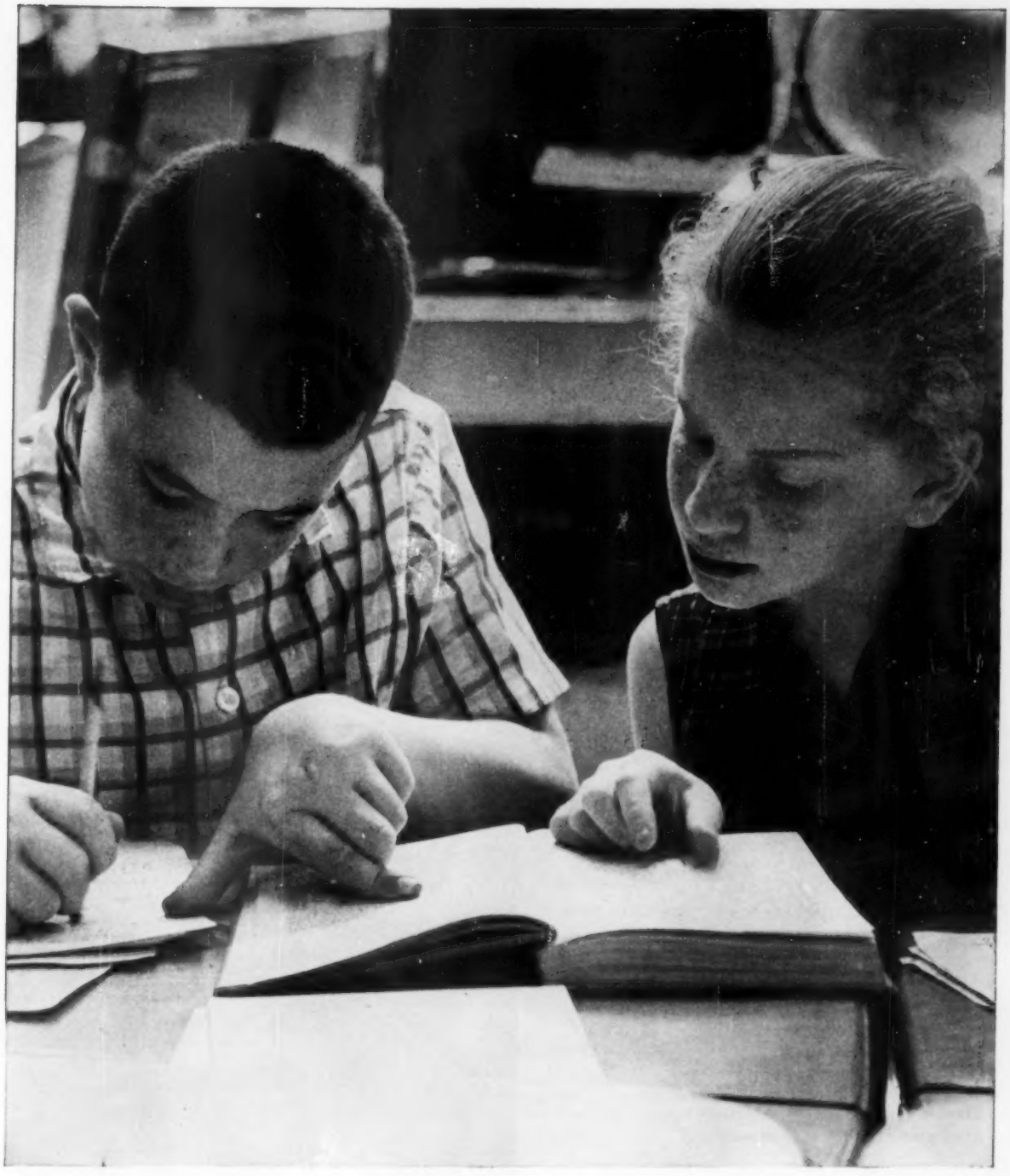
More Than Forty Years Of Leadership In Petroleum Refining Technology



"Nowhere is the need for knowledge about business more important than among America's young people . . . It is striking that they know so little through their formal education about the economic system which enabled them to go to school, in which most of them will work, and through which all of them will be supported at their graduation." —M. J. Rathbone, President

Esso

Standard Oil Company (New Jersey)

and affiliated companies

" . . . advanced technology and methods"

"In an industry such as ours, an industry whose accomplishments are little short of phenomenal, it is difficult to praise any one segment without deep consideration.

"Great contributions have been made by all elements. Cooperation between operating companies, manufacturers, drilling contractors, and service and supply companies has made possible the growth and progress our industry enjoys.

"Service companies, for instance, have given us advanced technology and methods for finding and producing oil and gas. These services are available when and where they are needed, at any time day or night, in any weather.

"Behind each drilling rig, each refinery, each gas plant or pipe line operation stands the manufacturer, the supplier and the service man. They provide engineering, research, products and services to keep the industry humming.

"As I said, it's hard to praise just one segment of the industry, but one thing is certain, all our jobs have been made easier and better because of the companies and men who give the service."

J. L. LATIMER,
President,
Magnolia Petroleum Company

P.E.S.A.*

* PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

PROUD TO BE PART OF A PIONEERING INDUSTRY

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

DU PONT *Petroleum Chemicals* NEWS

Number 95 in a Series of Bulletins for the Petroleum Industry

MARCH-APRIL 1959

Du Pont Helps Refiners Set Up Linear Programming

by Herb Bailey

Herbert O. Bailey, one of Du Pont's refinery technologists, and Joseph Testa discuss a linear programming problem as it is being fed into the computer. In just a few minutes the solution will emerge. Done by hand, the problem would have required weeks of time and reams of paper to solve.

Du Pont Develops AFA-1 for Aviation Gasoline

A new additive (AFA-1) is now being offered by Du Pont as a corrosion inhibitor for aviation gasoline. Since low dosages of AFA-1 are effective, it offers refiners opportunities for substantial savings in corrosion inhibitor costs. Another advantage of the low dosage is that the water tolerance test on aviation gasoline is more easily passed.

For details on this product and its use, call your Du Pont representative at the nearest Petroleum Chemicals Sales Office.

In today's highly competitive petroleum industry, maximum economy in all phases of operation has practically become a management "must."

An important tool in effecting economies is linear programming.

Linear programming, through the use of electronic computers, makes it easily possible to determine the economic effect of all known processing and blending variables in the production of gasoline. In this way human errors arising from prejudgment are minimized.

In order to help the refining industry take fuller advantage of the economy and efficiency offered by the use of linear programming, the Du Pont Petroleum Chemicals Division now offers a new technical service.

This service consists of helping refiners to organize the vital variables of processing and blending in such a way that modern calculation methods can

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DUPONT *Petroleum Chemicals* NEWS

CONTINUED *Linear programming*

be used to get an integrated analysis of all gasoline manufacturing operations.

The DuPont refinery technologists have completed numerous linear programmed studies of gasoline blending economics for customers. Operating variables and incremental manufacturing costs are incorporated in the evaluations.

These studies include such items as: the volume and value of the gasoline components in each blend; optimum reformer severity; the volume of components which should be purchased or sold; the product quality shortage or giveaway on all inspections related to specifications; the loss sustained by diverting components to other grades of gasoline or products through choice or necessity; the range over which the economic variables in a study may shift without changing the recommended blends; and, of course, the economic usage of TEL as an octane control additive.

While such studies obviously cannot always result in major savings, in one instance it was shown that a loss of over $1.00 per barrel was being suffered by diverting one component to a less profitable alternate use. In a second instance, the price being paid for a purchased component was much more than its worth to the user. Such results as these could be determined in an analysis of your own operations.

The men responsible for our linear programming service

JACK S. BELLAH joined the Petroleum Chemicals Division as Refinery Technologist in 1953. He is a graduate chemical engineer from the University of Tennessee. He spent six years at the Socony-Vacuum Oil Company working on petroleum test programs, economic studies, process engineering, and product development. He also worked for Mathieson Alkali Works and at Stanolind Oil and Gas Company in Tulsa, and the Refinery Engineering Company before coming to DuPont.

HERBERT O. BAILEY holds a chemical engineering degree from Rensselaer Polytechnic Institute. Mr. Bailey spent 12 years in the Technical Service Division of Esso Standard Oil Company doing refinery test work, gasoline blending studies, and crude oil and finished product evaluations. He joined DuPont in 1953, starting in sales. Last year he joined the Planning Section in Wilmington as a Refinery Technologist.

New Series–Additives Handling Bulletins

Just a year ago DuPont began a service designed to make the use of petroleum additives as easy and economical as possible for DuPont customers.

It consists of a series of bulletins on special subjects of interest to those who buy additives.

The first bulletin deals with the use of duplex pumps in place of the simplex type for keeping additives free-flowing in cold weather.

Another bulletin covers in detail the knowledge needed for the easiest and most efficient handling of DuPont Rust Preventive No. 2.

These bulletins are written by the men of the "Operations Group." All of them are experienced in the handling of tetraethyl lead and other petroleum additives.

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Pittsburgh 22–1 Gateway Center . . . ATlantic 1-2933
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In Canada–DuPont of Canada Limited, Petroleum Chemicals, 85 Eglinton Ave. East, **Toronto 12**–Ontario . . . . . HUdson 1-6461
OTHER COUNTRIES: Petroleum Chemicals Division, Export Sales, Wilmington 98, Delaware, PRospect 4-2962.

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Du Pont Tetraethyl Lead and other Petroleum Additives

OVER

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A-10220

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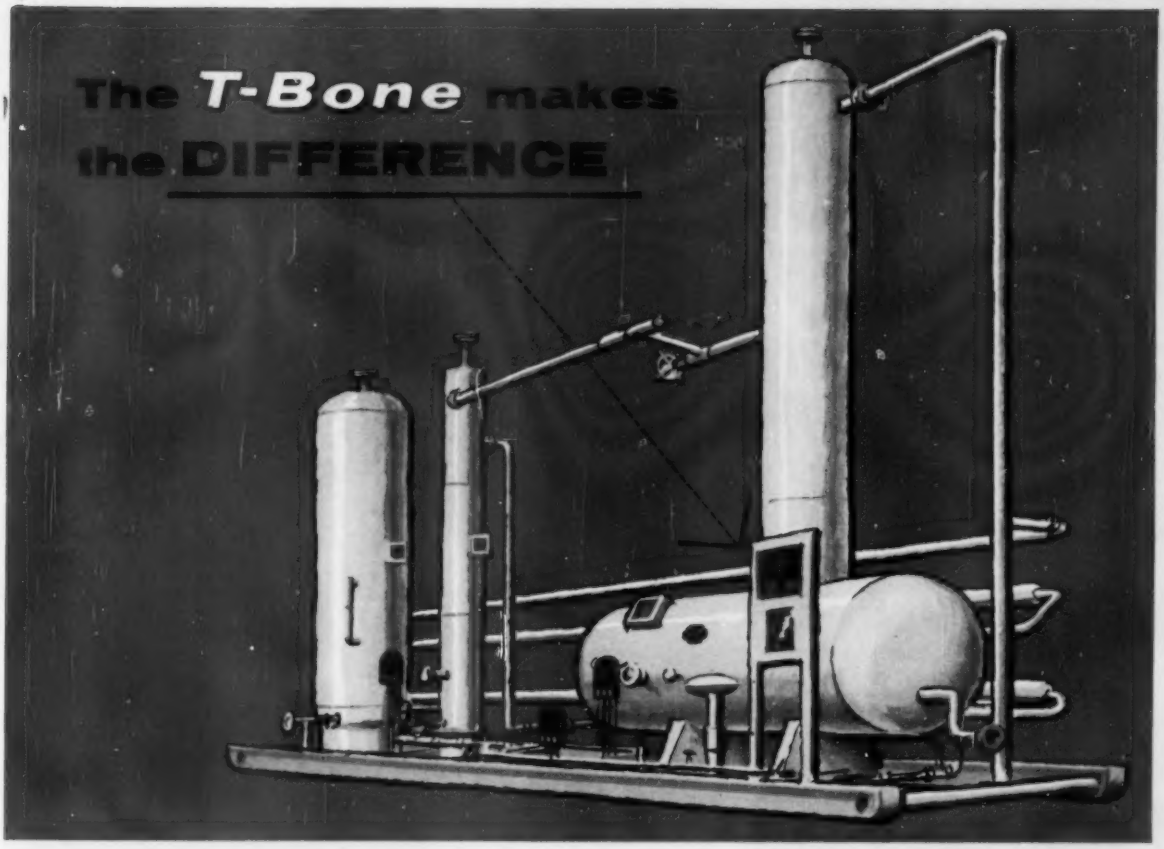

PARKERSBURG "SLIM JIM" HYRECO

Cold Separation Unit

The T-Bone is the **only** exclusive feature offered in the field of low-temperature separation.

Parkersburg pioneered this method and its "Slim Jim" unit includes the two basic shapes necessary to provide **maximum** low-temperature separation and partial stabilization of the liquid recovered.

The T-Bone produces lower outlet gas temperature assuring **greater** liquid recovery . . . delivers a more stable product to the stock tank.

ANOTHER
PARKERSBURG
OUTSTANDING
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THE PARKERSBURG RIG AND REEL CO.
PARKERSBURG WEST VIRGINIA
MADE IN U.S.A.

See Your
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Man Today!

"SLIM JIM"
SAVES VALUABLE SPACE

Engineered with the "tight spots" in mind, the Parkersburg "Slim Jim" offers a streamlined, compact design that saves valuable platform and foundation space.

THE
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Division of Parkersburg-Aetna Corp.

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MULTI-PURPOSE GREASE H
offers you these advantages:

- It allows you to buy one grease in quantity, and save on quantity discounts.
- It simplifies your record keeping and inventory.
- It keeps your storage requirements to a minimum.

Using MULTI-PURPOSE GREASE H reduces the chance of applying the wrong grease. It gives faster turnover of opened cans, with less possibility of deterioration or contamination of the grease in opened cans.

Humble MULTI-PURPOSE GREASE H is a superior lubricant for chassis, track rollers, wheel bearings, water pumps, ball and roller bearings and universal joints. MULTI-PURPOSE GREASE H matches or exceeds the quality of every single-purpose grease it replaces. It's not affected by heat or water. And it maintains its consistency. This means it is easily applied even on cold days, and it gives sure lubrication summer or winter.

For quick delivery of MULTI-PURPOSE GREASE H, call your nearest Humble wholesale plant in Texas and New Mexico, or call or write:

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Consumer Sales
P. O. Box 2180
Houston 1, Texas

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HUMBLE OIL & REFINING COMPANY

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SAVE with Electric Operation

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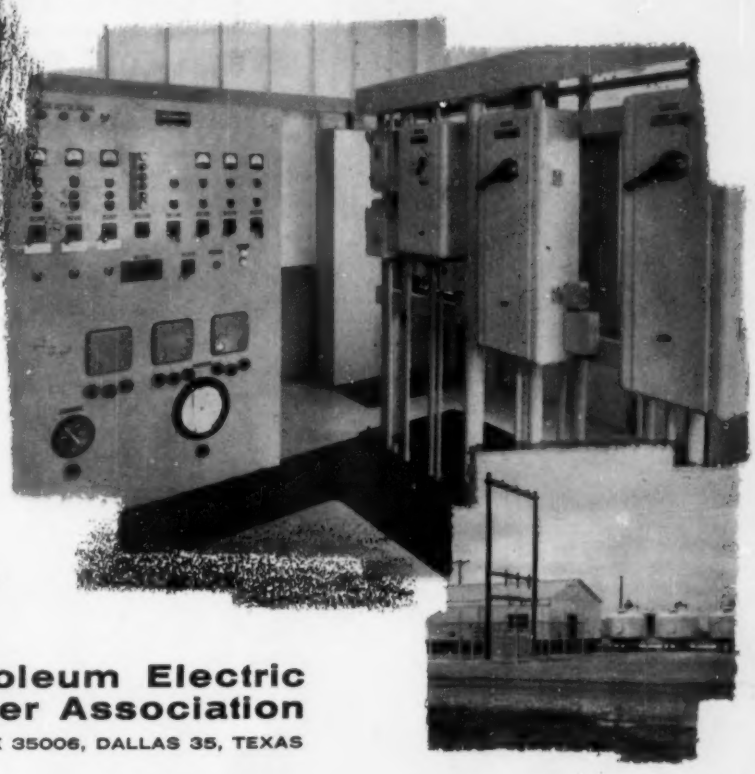
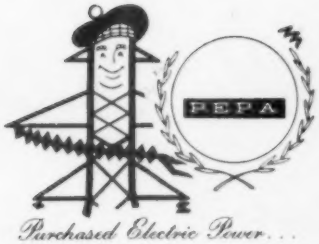
This automatic electric control equipment designed and installed by a major oil company provides the greater flexibility of operation and dependability required for utmost economy in water flooding as well as remote control for field pumping. View at bottom shows 500 KVA transformer station supplying Purchased Electric Power to the pumping plant.

For information on savings Electric Power offers your operation, call your nearest Utility Electric Service Company or write us.

Three 100 HP, 440 V motors driving pumps supplying imput water





Purchased Electric Power . . . saves money, manpower, maintenance and serves you better automatically

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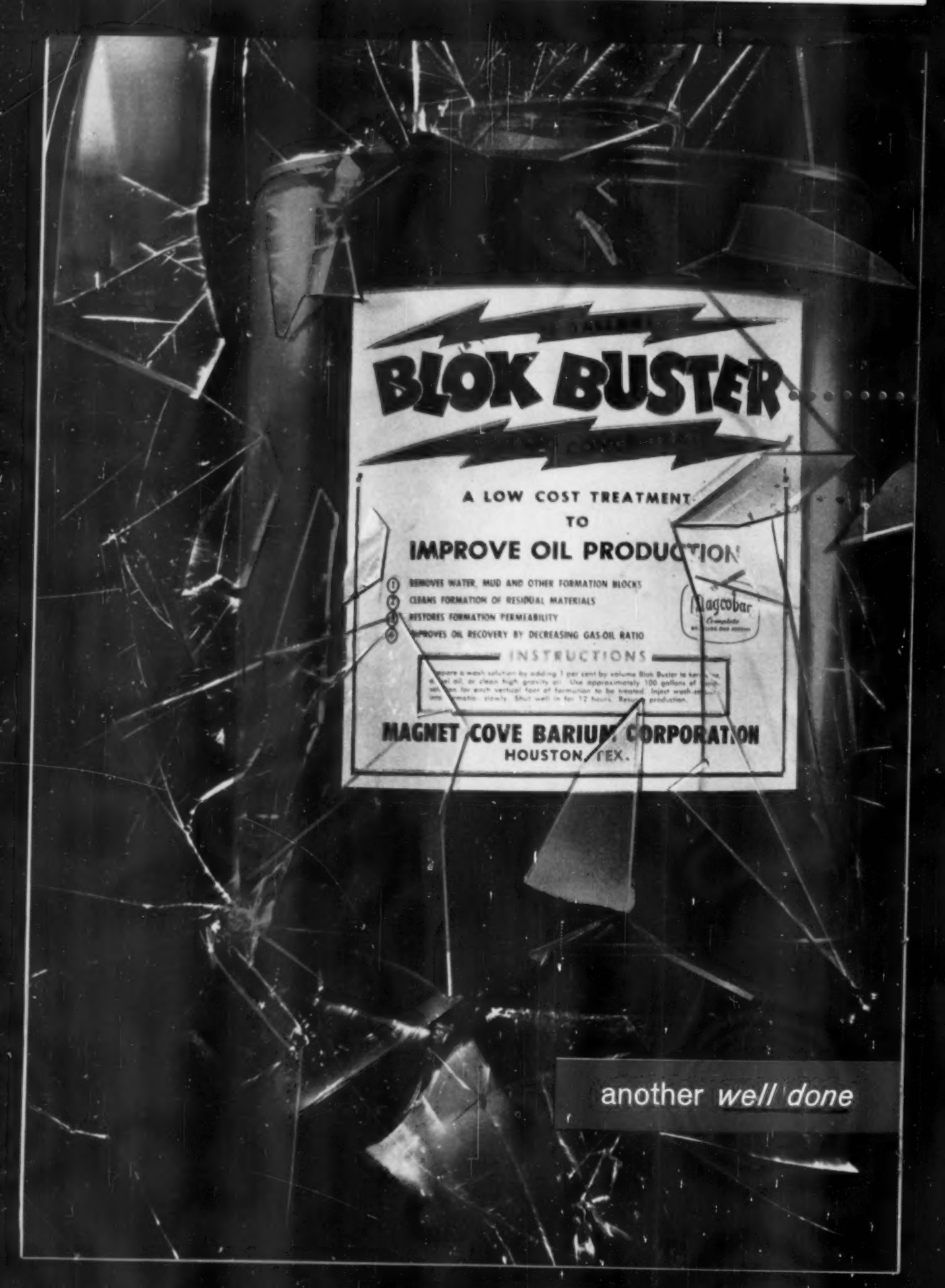
BLOK BUSTER
A LOW COST TREATMENT
TO
IMPROVE OIL PRODUCTION
1 REMOVES WATER, MUD AND OTHER FORMATION BLOCKS
2 CLEANS FORMATION OF RESIDUAL MATERIALS
3 RESTORES FORMATION PERMEABILITY
4 IMPROVES OIL RECOVERY BY DECREASING GAS-OIL RATIO
INSTRUCTIONS
Magcobar
MAGNET COVE BARIUM CORPORATION
HOUSTON, TEX.
another well done

breaks mud, water, and emulsion blocks to increase well production

Blok Buster increased production in these wells

Well did not produce as well as reservoir indicated	*Originally produced 10 BOPD from Dakota "J" sands. After a 10-gal. Blok Buster treatment, production was increased to 43 BOPD and is still pumping 36 BOPD five months later.*
Well did not resume normal production after workover	*Well producing 1 MMCF gas and 30 to 35 bbl. distillate per day from Frio was killed. Following workover, the distillate production was lost. After a 5-gal. Blok Buster treatment, production was increased to 1.5 MMCF and 11 to 14 bbl. distillate per day. Two months later this production is still holding.*
Well did not increase following hydraulic fracturing	*Well had average production of 5 BOPD and 20 bbl. water. Following fracturing operation, well produced exactly same. Using 35 gal. Blok Buster, production after 21 days was increased to 16 bbl. oil and 11 bbl. water per day.*

Blok Buster will open your pay-zones, too, to increased, long lasting production. Here's how it works: Powerful surface-tension reducing agents destroy water blocks in the pores of formations. Powerful dispersants in Blok Buster move clay particles and inorganic solids out of the formation into the well bore. All existing emulsions which might limit production are broken.

But even with this power, Blok Buster can't hurt your well. It won't form emulsions or change the wettability of reservoir rock. It's absolutely non-corrosive, won't damage tubing or well head, will not affect refining operations. Blok Buster is completely soluble in oil and will not form a sludge with reservoir hydrocarbons or water. Plus, Blok Buster is easy and economical to use. The average Blok Buster treatment is only 20-30 gallons — much less than the cost of workovers or acidizing.

Blok Buster is another example of the cost cutting products developed by Magcobar, proof that the right products *used right* on your wells can cut your costs. A Magcobar engineer can advise you on application techniques for your particular production problem. Blok Buster is available in 5-gallon cans from any of Magcobar's 500 stockpoints in the United States and Canada. Elsewhere, write Foreign Operations, P. O. Box 6504, Houston, Texas.

with Magcobar Technology

MAGNET COVE BARIUM CORPORATION

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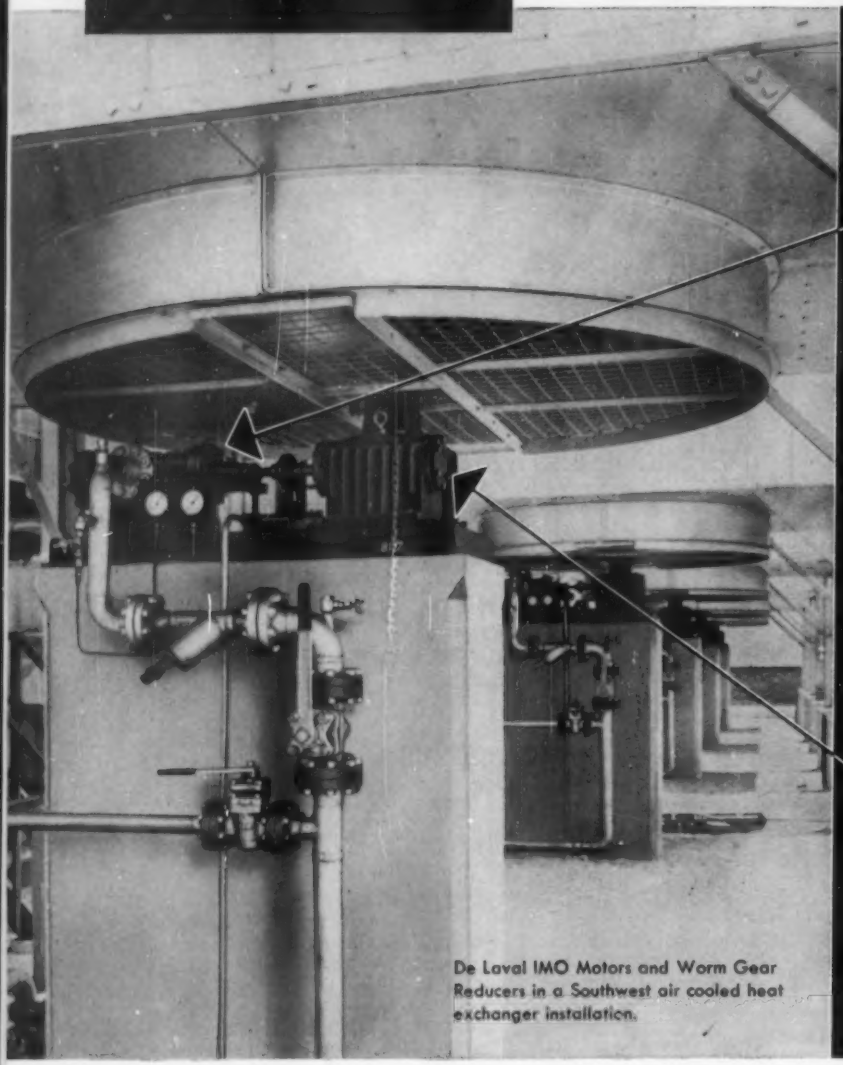
Magcobar
Complete
DRILLING MUD SERVICE

59-203

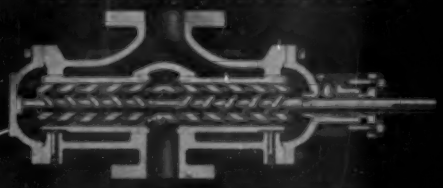
DE LAVAL
HYDRAULIC FAN DRIVES

do dependable, power-saving job in air-cooled cooling towers



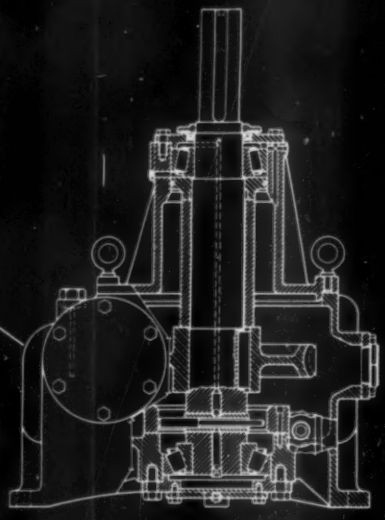
De Laval IMO Motors and Worm Gear Reducers in a Southwest air cooled heat exchanger installation.

De Laval IMO Motors and Pumps



simple, reliable, pulsation-free

De Laval Worm Gear Speed Reducers



ruggedly built for severe service

De Laval Hydraulic Fan Drives for air cooled heat exchangers and cooling towers *save power* since the fan operates at full speed only a portion of the time. Furthermore, there is no demand charge on hydraulic power. • Equally important, they provide *accurate, automatic* control of engine jacket water temperature, and also assure *complete operational flexibility*. Due to the simplicity of De Laval IMO motors and pumps as well as the rugged construction of De Laval Worm Gear Reducers, these units stay on the job for years. Both IMO motor and speed reducer are mounted and factory aligned on a single bedplate.

Investigate *all* the advantages of De Laval Hydraulic Fan Drives. Send for your copy of Bulletin 3009 which includes helpful performance data.

DE LAVAL *Hydraulic Fan Drives*

DE LAVAL STEAM TURBINE COMPANY

810 Nottingham Way, Trenton 2, New Jersey

DL870

Any way you look at it--

TRIPLE STRING

completions are rewarding to the operator. With today's advanced tools, production and completion operations are entirely safe. Each year brings improved equipment and techniques, such as the fully retrievable hydraulic-set packers now available.

TRIPLE STRING

completions can be made at very little additional cost. After all, it's a matter of pure economics. Fewer wells need be drilled and payout is faster. P·R·I·M·E® completions have operational advantages due to flexibility of down-hole arrangements.

TRIPLE STRING

completion equipment was developed by Brown Oil Tools—and don't forget, Brown can supply your needs for single, dual and quadruple string installations.

There is a Brown Oil Tools representative near you. Ask him for the latest information on ***multiple alternate completions.***

Visit our booth (59-60) in the Texas Bldg. at the Tulsa Oil Show.

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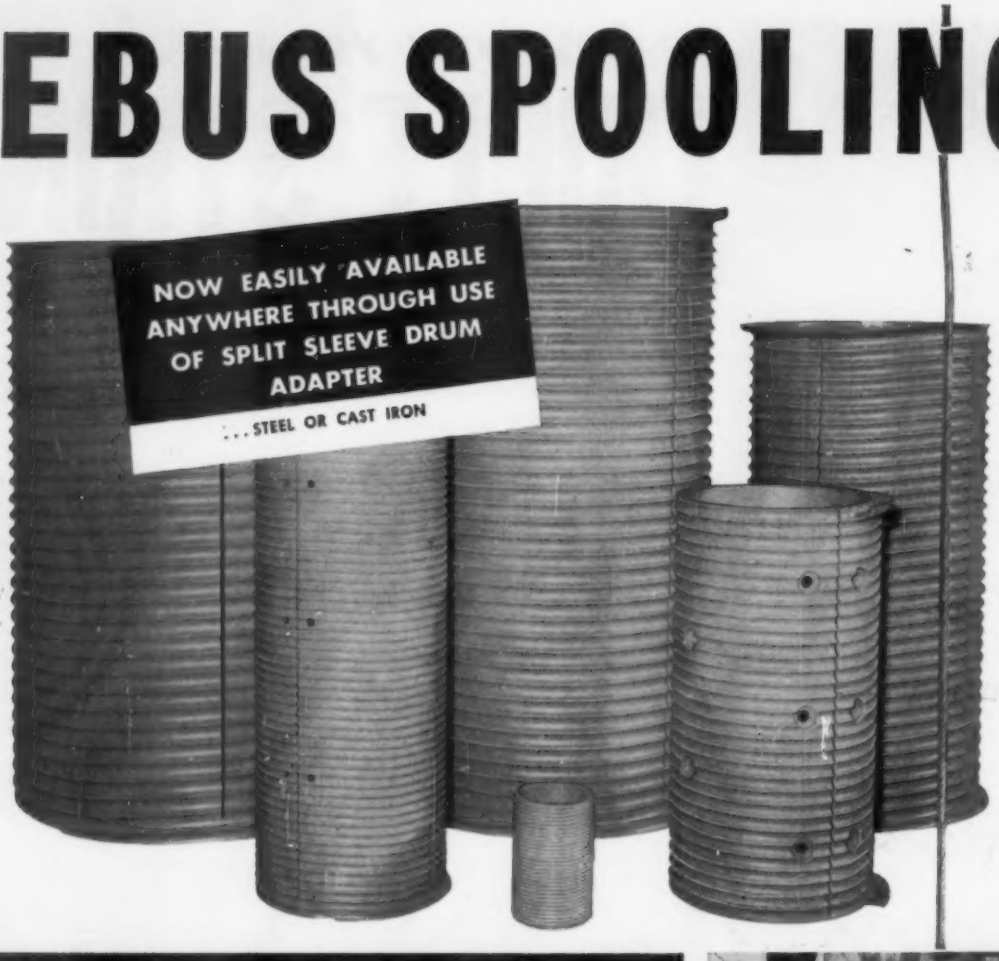
8490 KATY ROAD HOUSTON, TEXAS

P·R·I·M·E® — (Parallel Retrievable Independent Multiple-string Equipment)

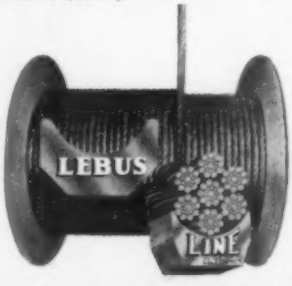
LEBUS SPOOLING



FOR ALL TYPES OF HOISTING UNITS

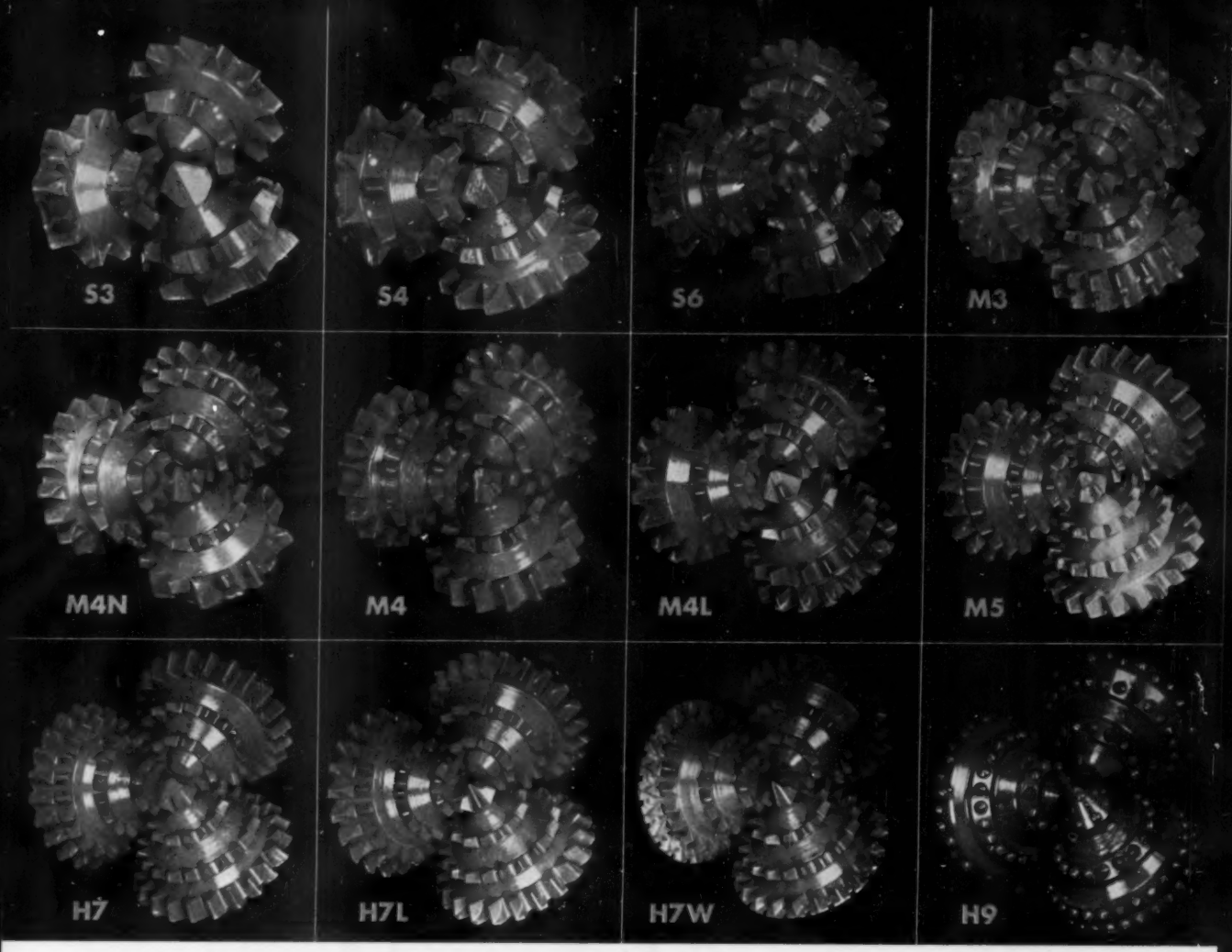
In addition to the standard grooved segments, LeBus provides a complete stock of Machine Grooved Split Adapter Sleeves for all sizes up to 2½" line and to fit up to a 36" "Drum" core for quick installation anywhere. This grooving is ideal for many types of drum grooving. For example, units already in operation requiring a line size change can quickly be converted with LeBus Split Adapter Sleeves. If two different size lines are used a removable sleeve can be installed. The LeBus Split Adapter Sleeve Grooving installation is flexible to meet any situation and may be easily and expertly bolted or welded by any good mechanic. Write today for complete details . . . enjoy trouble-free spooling this fast, easy way!

The above pictures a mechanic preparing to fit the second half of a machine grooved Split Sleeve or adapter for drilling and bolting. A Split Sleeve can be more easily welded. These installations can be made in factory, storage yard or on the job where hoist is operating.



LEBUS INTERNATIONAL ENGINEERS, INC.
LONGVIEW, TEXAS

LEBUS...WORLD HEADQUARTERS FOR *Engineered Spooling* COUNTERBALANCE - PYRAMID - HELICAL



SECURITY Makes the *Right Bit* for the Job!

Security manufactures a *complete line* of rock bits — including 1120 types, sizes, and other variations — a few of which are illustrated above. Each satisfies a specific combination of drilling conditions, to meet the oil industry's most exacting requirements.

There are Security bits for the softest shale having the lowest compressive strength. There are Security bits for every intermediate condition and complication up to and including the hardest flints and quartzites.

Security bit sizes range from 5⅝ to 15 inches. Pin sizes vary from 3½ to 6⅝ inches. Circulation types include regular, jet, air, and jet air.

Selecting the RIGHT bit assures fastest penetration, maximum footage, and greatest drilling economy. Rely on Security to furnish the RIGHT bits for every well you drill. Send for Security's 1959 fact catalog of rock bit information.

Security

PLANTS: Dallas, Texas; Whittier, California; Manchester, England...
SECURITY ENGINEERING DIVISION, 3400 W. Illinois, Dallas, Texas...
EXPORT OFFICE: P. O. Box 13647, Dallas, Texas... CANADA: Security Engineering Canada, Ltd.; Edmonton, Alberta, Canada...
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Available Through Your Favorite Accredited Supply Store

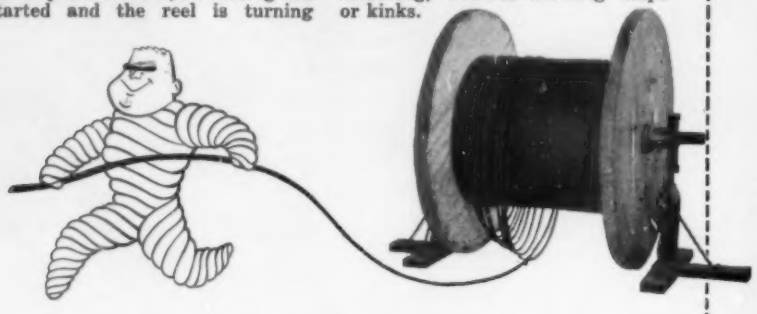
Tuffy® Wire Rope Tips

More Damage is Done by Broken Rules Than by Broken Strands—

Rule 1: RIGHT WAY to Set Up Reel for Unwinding

The stock reel should be set up on jacks, so the rope will come from the under side of the reel.

In the picture below, unwinding has started and the reel is turning faster than the rope is being pulled off. But no damage is done. Why? Because in coming from the under side of the reel, the rope is simply loosening, without forming loops or kinks.

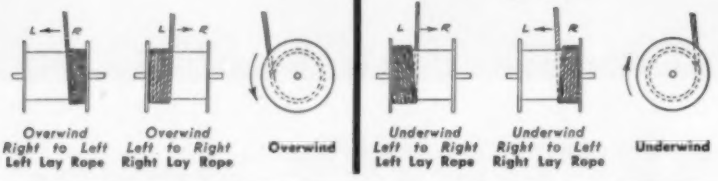


Rule 4: What's The Correct Lay for Each Type of Winding?

"Lay" refers to the direction of the strands in wire rope. It's a **right** lay rope when the strands pass from left to right across the rope. It's **left** lay when they pass from right to left.

The direction of winding on the drum is determined by standing behind it, looking toward the direction of rope travel.

When winding one layer only on a smooth drum, the right and left lay ropes indicated in the drawings below will give the best service.



Overwind **Right to Left Left Lay Rope** | *Overwind* **Left to Right Right Lay Rope** | **Overwind** | *Underwind* **Left to Right Left Lay Rope** | *Underwind* **Right to Left Right Lay Rope** | **Underwind**

Tuffy Balanced Standard Rotary Line helped drill the world's deepest well—Wildcat I-EE in Pecos County, Texas. This rotary line is famous for top performance in use with standard rigs in any formation. It also does an outstanding job with jacknife rigs in deep drilling beyond 6000 feet.

Tuffy Balanced Jacknife Rotary Line: Made to the special needs of jacknife rigs drilling to 6000 ft. Has extra strength, with greater flexibility to move at higher speeds over the smaller sheaves and drums of jacknife rigs, and to give better reeving and spooling.

Tuffy Balanced Slings & Hoist Lines This team has made a name for cutting hoisting and downtime costs in all types of materials handling. Tuffy Hoist Line gives the balanced combination of strength and flexibility needed for a longer running rope. Tuffy Slings are made of an extra flexible, high-strength machine-braided fabric that smooths out uninjured after knotting or kinking.

FREE!

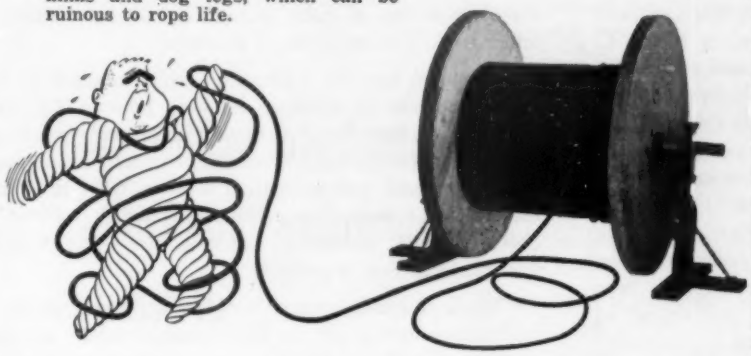
Complete handbook of wire rope use in oil field service

Latest, most complete information ever compiled on the subject in one publication. Shows the various rope constructions used by the oil industry, and gives full data tables on each. Includes (in their entirety) "A.P.I. Specifications for Wire Rope" and "A.P.I. Recommended Practice on Application, Care and Use of Wire Rope for Oil Field Service."

Write Union Wire Rope Corporation, 2102 Manchester Ave., Kansas City 26, Mo. Specialists in high-carbon wire, wire rope, braided wire fabric and stress relieved wire and strand.

Rule 2: WRONG WAY to Set Up Reel for Unwinding

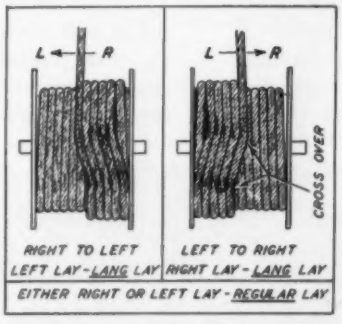
The rope is coming from the top of the reel and forming loops as it overruns. These loops are likely to form kinks and dog legs, which can be ruinous to rope life.



Rope for multiple layer winding: When a rope winds in the first layer across the face of a drum, it usually forms a uniform helix. On reaching the flange of the drum, the rope rides upon the last turn and starts winding back across the face of the drum, but falls into the depression of the successive turns of rope on the first layer.

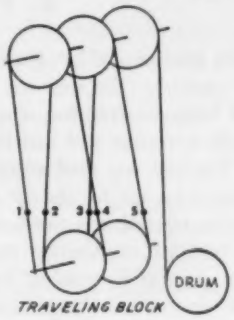
Advancing across the drum on the second layer, the rope, following the depressions of the first layer, actually winds **back** a turn in each revolution of the drum. It must then cross over **two** depressions of the first layer to have a net advance of one turn per revolution.

This cross over is unavoidable on the second and succeeding layers. Severe punishment of the rope results, due



to abrasion of the adjacent turns against each other, and the crushing from the next layer above at these points. Parallel-grooved controlled cross-over drums minimize this condition.

Rule 3: How to Figure Reeving Loads



Reeving ropes through the sheaves multiplies the number of parts supporting the load. The lead line to the drum carries the weight of the load lifted, divided by the number of parts, plus the accumulation of friction on all sheaves.

To count the number of parts supporting the load, draw an imaginary line across the parts of the rope supporting the load.

The efficiency of reeving systems ranging from one to eight parts is shown in charts which Union Wire Rope engineers make available to users.

Rule 5: Use the Tuffy Special Purpose Wire Rope "Tailored" to a Specific Application

There was a time when just any size and lay of rope was cut from a stock reel and used for just about any kind of service. It's different today. The various constructions of Tuffy Ropes are precisely fitted to each type of use.

There are thousands of different wire rope constructions. Union Wire Rope makes them all. But there's only one Tuffy line of ropes. Each Tuffy is the right rope and the best rope for the particular work for which it was developed. Each is "job prescribed". Each has the right balance of strength, flexibility and toughness to give you longest service, greatest efficiency and safety.

Union Wire Rope Corporation, Subsidiary of Armco Steel Corporation. Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand. 2102 Manchester Avenue, Kansas City 26, Mo.

Your Tuffy Distributor Can Help You Get Longest Service Life and Cut Rope Costs

UNION Wire Rope

ARMCO

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New steels are born at Armco

3

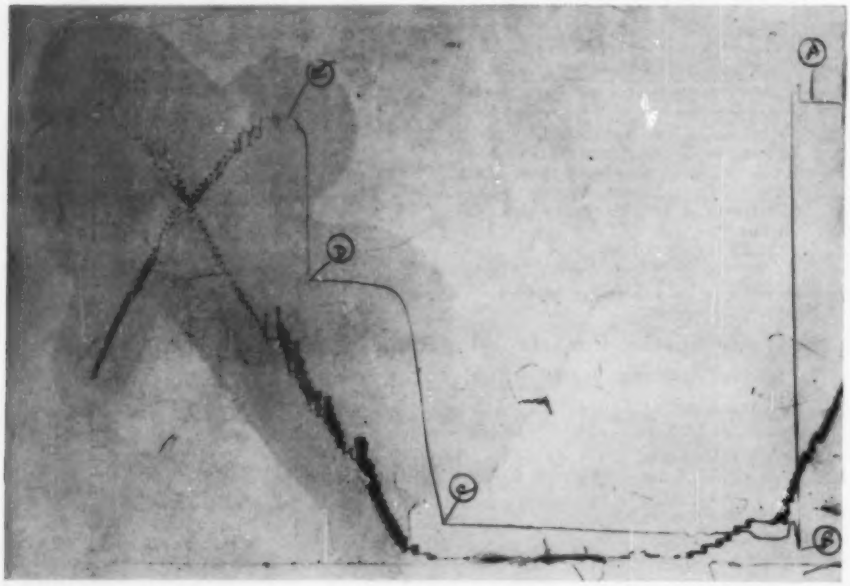
168 Barrels Of Oil A Day From A Dry Hole

This is the story of how an apparent dry hole was made a 168 bopd producer. The well was drilled by Mr. A. C. Torgeson of Torgeson Oils, Inc. who realized a successful producer from a wildcat well that could easily have been abandoned. The well was spudded in Weld County, Colorado, and was projected for the "J" sand around 6900 ft. The sand, when reached, was cored and an electric log was run. These revealed conclusively that the "J" sand was unproductive . . . that it contained only water. Had it not been for the alertness of the consulting geologist on the well, Paul "Skipper" Keller, the well would have been plugged and abandoned. Keller, however, had noticed an oil show in the cuttings from the "D" sand approximately 100 feet up the hole. The "D" sand was generally unproductive in the area and a thorough study of all available evidence indicated that it probably would be unproductive in this well even though there was a show in the cuttings. Normally a well of this type would have been abandoned immediately, but Mr. Keller was reluctant to do this in spite of the seemingly overwhelming odds against making a successful producer. The decision was then made to run a drill stem test in order to evaluate all the available information. The result was a producer!!!

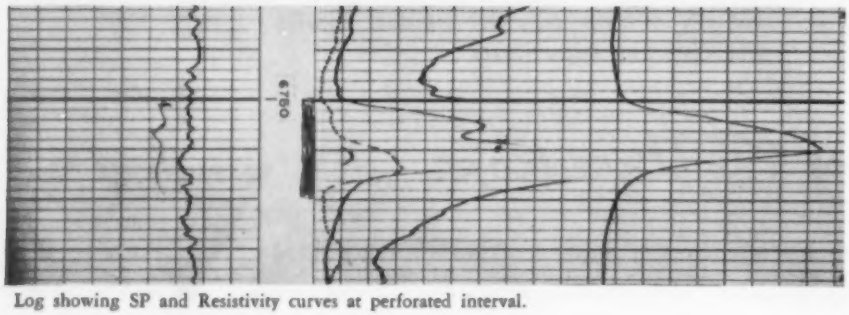
To obtain the test information which resulted in a positive decision to complete the well, Johnston Testers was called in from the Fort Morgan office and a straddle test was run. On the basis of the drill stem test, casing was set and the well perforated from 6758 to 6764 ft. The initial flow of the well was 168 bopd through a 30/64" choke. No well stimulation treatment was required and a dry hole became a producer.

This is an excellent example of the necessity of gathering and evaluating all the data possible before setting casing on a well that might be dry, or before abandoning a possible producer.

This well clearly demonstrates that it is unwise to discount any possible pay or write-off any well prematurely. It also demonstrates that Drill Stem Testing pays off in handsome dividends. The cost of a drill stem test is very small compared to the investment made in the drilling of the well. Test—to be absolutely sure.



Drill Stem Test chart for the Torgeson State No. 1. Tool was open for two hours with forty-five min. shut-in. Gas to surface in 18 min. (800,000 cu. ft.) and a good blow was observed. 550 ft. of oil and 270 ft. of oil and gas cut mud were recovered. No water was present. Initial flow (B) was 108 psi and final flow (C) was 291 psi. Final shut-in pressure (D) was 2221 psi.



Log showing SP and Resistivity curves at perforated interval.

JOHNSTON DRILL STEM TESTING TESTERS

Why rubber products of Du Pont neoprene cut costs

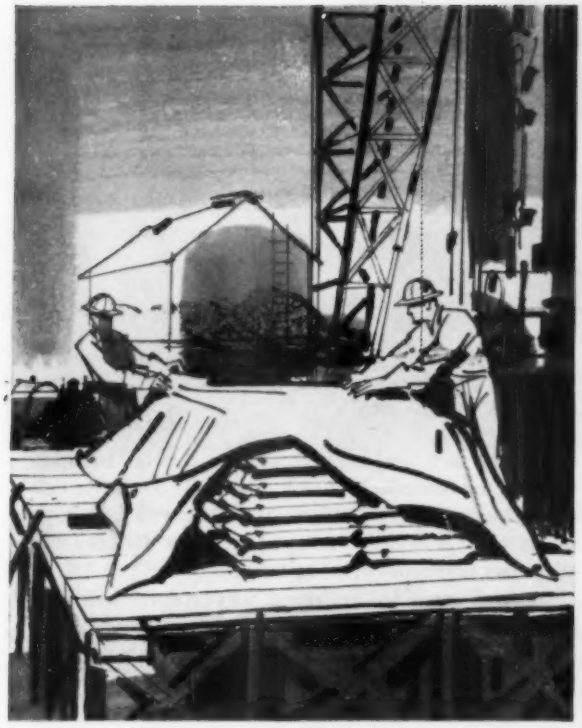
Neoprene products provide extra durability, long, dependable service. For example:

> Neoprene gaskets on crude oil storage tanks prevented leakage for 9 years. Ordinary rubber gaskets lasted only 6 months.
>
> Neoprene linings in a refinery cooling line stopped corrosion despite brackish water at 130°F. and traces of oil. Other materials failed within a year.
>
> Neoprene coated oil rig shelters have given 4 years of low-cost, convenient protection despite exposure to severe weather.

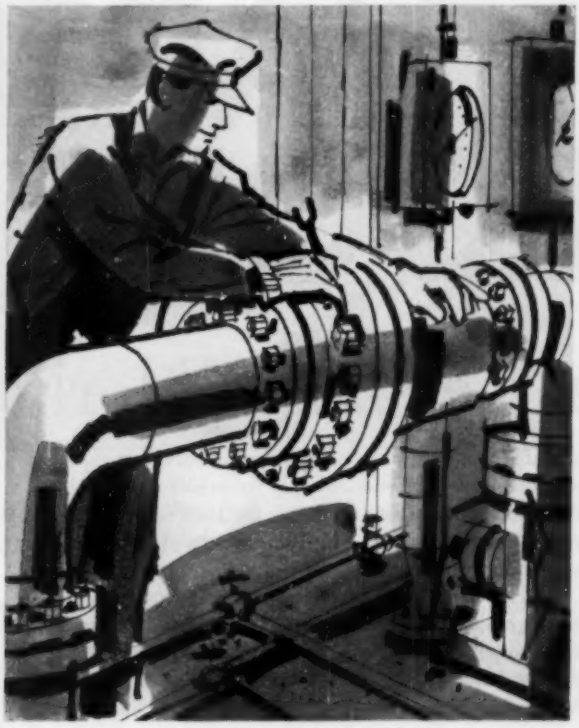
This means longer service per dollar, reduced replacement costs, minimum downtime.

Neoprene is a versatile synthetic rubber. It resists deterioration from oils and greases, most organic and inorganic chemicals. It is heat and weather resistant, will take tough, abrasive punishment, and will not support combustion.

Ask your supplier about neoprene the next time you order maintenance rubber goods for refinery, production and pipe line equipment. For additional information write for "Du Pont Elastomers in Industry," E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Dept. OG-4, Wilmington 98, Delaware.



Neoprene coated nylon tarpaulins retain their flexibility and strength in all kinds of weather; they are lightweight and compact.



Gaskets of resilient Du Pont neoprene resist compression set, apply sustained pressure keeping joints tighter longer.

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SYNTHETIC RUBBER

NEOPRENE
HYPALON®
VITON™
ADIPRENE®

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

GOOD TIME FOR HARD LOOKS

at needless chlorine costs

Columbia-Southern's manufacturing and servicing experience with quality chlorine may help you achieve appreciable savings on former costs. Isn't this the ideal time to see if your chlorine purchase and use practices aren't costing more than necessary?

Let's take the *quantity* of chlorine you are currently buying and handling. Is your operating volume most economically adapted to tank car, barge, ton tank, or cylinder delivery? Are you quite sure that new or projected changes in your products or processing won't change this picture? Do you have all the facts on completely up-to-date unloading techniques and equipment?

Let's look at the uniform *quality* of the chlorine you are receiving. Here again, Columbia-Southern can advise you with recognized authority as the country's leading merchant producer. As a matter of record, we have led in developing such vital improvements in chlorine transportation as the fusion-welded tank car, the 55-ton single unit car, the safety-dome platform, the industry's first large capacity barge fleet for inland waterways delivery, and other user economies or safety features.

Our well-grounded Technical Service specialists, too, have helped customers save on needless chlorine costs. One valuable aid, for example, is their extremely thorough yearly inspection of your unloading, storage, and use operations. Isn't it simple good business, especially now, to see what savings they might work out for you? You may request their services either through our Pittsburgh address, or any of the fourteen Columbia-Southern District Sales Offices.

The Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania. Offices in principal cities. In Canada: Standard Chemical Limited

COLUMBIA-SOUTHERN CHEMICAL CORPORATION A Subsidiary of Pittsburgh Plate Glass Company

Lower Battery Drain—No need now for heavy duty batteries and generators. Current drain on "stand-by" is 1/3 that of tube-type receivers, 1/15 with battery saver switch.

Greater Reliability—Transistors, printed circuits and new design all greatly increase reliability.

Smaller, Lighter—Approximately 1/2 the weight, 1/3 the size of other models. Mounting in tight quarters easier than ever.

Completely transistorized receiver and power supply... Another Motorola First!

Here is 2-way radio with efficiency and reliability never before approached in mobile radio. No more tubes in the receiver —no more vibrators in the power supply . . . all are replaced by long life, dependable transistors. No longer is it necessary to idle the vehicle to keep the radio operating. Savings in gasoline, engine wear and batteries add up fast. Let us prove to you how MOTRAC radio will cut your radio operating costs . . . while giving you reliability never before possible. Write today.

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Save dollars 4 ways with UNICOR®

1. Maintain flow capacity

Unicor prevents corrosion in pipelines—keeps pipelines free of scale. With Unicor you are assured of maintaining maximum flow capacity, C factor and output.

2. Reduce downtime

Downtime to scrape lines and replace filters is production time lost. Prevent such loss with Unicor. It keeps equipment free of products of corrosion.

3. Cut filter replacements

What's your annual bill to service and replace filters? A pretty penny, no doubt. You can drastically reduce this expense by using Unicor.

4. Increase equipment life

Tanks, vessels and pipelines stand up longer when you give them effective protection against corrosion. A little Unicor goes a long way—protects against corrosion from well to consumer.

Unicor, the preferred oil-soluble corrosion inhibitor, can be added to your product at any point in your operation. Costs less than a tenth of a cent per barrel of product. Write our Products Department for detailed information. Ask about samples and how to test them.

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Des Plaines, Illinois, U.S.A.

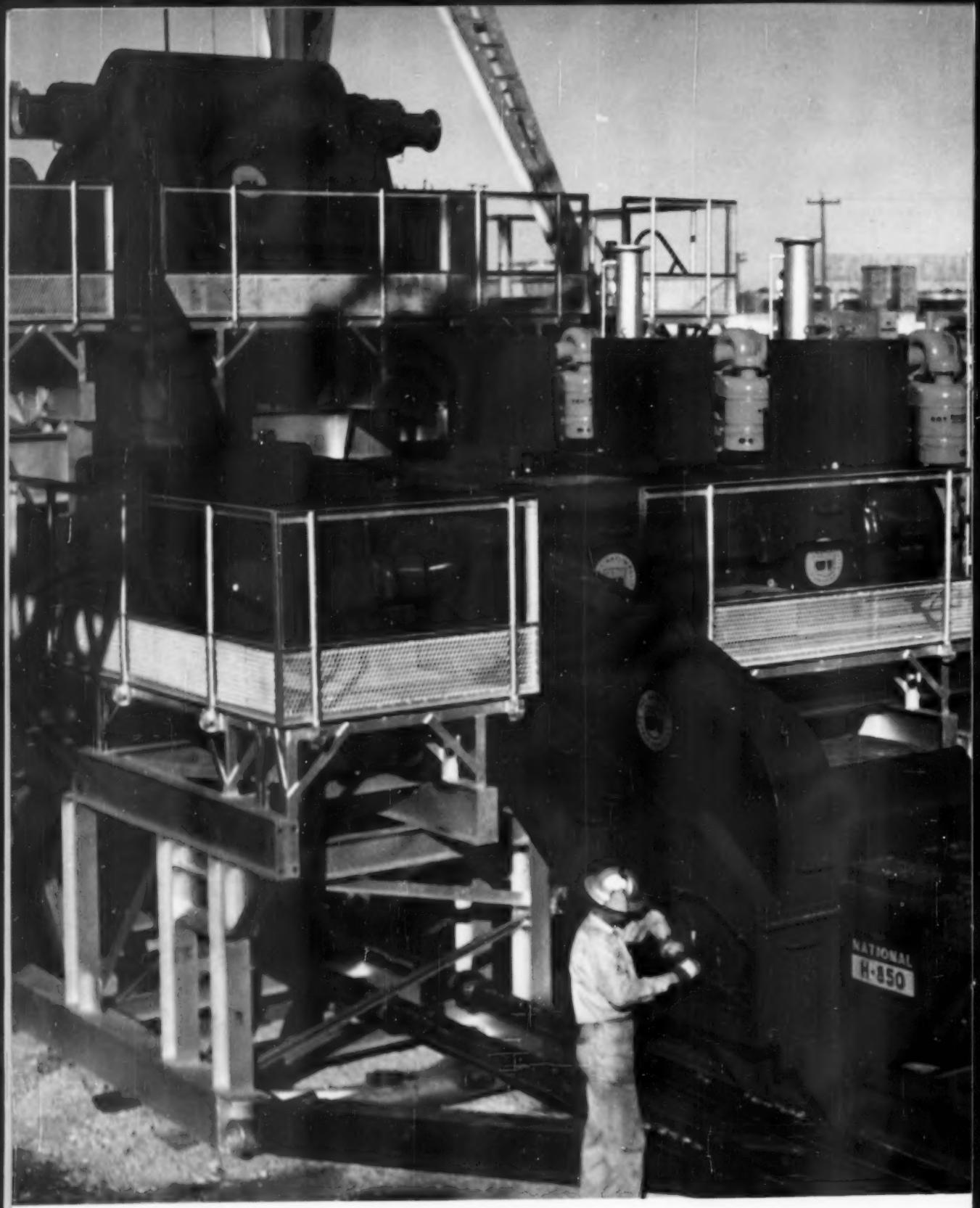
More Than Forty Years Of Leadership In Petroleum Refining Technology

Oilmaster Pumps are typical of the broad line of quality equipment available through National's 124 stores.

This is the NATIONAL SUPPLY STORE, too!

Do you need service on a downwell pump—or do you need a new one? You're never very far from the National Supply service that can help you quickly. Most National Stores have pump shops—equipped with modern facilities and run by trained personnel. When you stop, take time to see the rest of the store and the warehouse. Every National Store offers an unmatched variety of quality equipment for all your needs.

On the next pages:
National Drive Group advantages



National Drive Group arrangement for a National Type 110 Rig (as assembled for a complete rig-up in our Houston Plant yard). National's sectional construction saves space, provides for a minimum number of wearing parts and trouble-free operation.

See them at the
INTERNATIONAL PETROLEUM EXPOSITION
Tulsa • May 14-23

You get maximum flexibility and many design advantages with National Drive Groups!

The choice of many alternative arrangements and a host of big design advantages are yours when you specify National Drive Groups. Check these National features and prove it to yourself:

SECTIONAL CONSTRUCTION—A basic advantage pioneered by National, this insures unmatched and fast adaptability to various drilling and slush pump requirements. Drives are compact, factory pre-aligned, easy to move and rig-up. Groups of two to five sections can be quickly assembled for a power plant of any capacity.

ENGINE COMPOUND CHAIN ENCLOSURES—When the group sections are joined, chain is enclosed in a continuous, in-line case. Chain is cascade lubricated from a built-in oiling system. Chain enclosures can be quickly broken for moving or inspection, and have protective cover plates for moving or storage.

POWER TRANSMISSION ARRANGEMENTS—Engines for National Drive Groups may be furnished with National Hydraulic Couplings, National Torque Converters or mechanical and air clutches.

ENGINE ADAPTABILITY—Pads or bases for mounting selected engines are integral in the frames. Any make of engine in oil field use may be installed.

OPTIONAL PUMP DRIVES—These include: Drives for one, two or three slush pumps; V-Belt or chain drives to the pumps; Single or two-speed pump drives.

NATIONAL DY-A-FLEX AIR CLUTCHES—Outstanding for rugged performance, these clutches are furnished for pump drives and, on rig drive groups, in the master clutch position.

AIR OPERATED CONTROLS—Air piping for controls is installed in the frames at the factory. Controls are conventionally located at driller's position for: engine throttles and clutches, pump drive clutches, master clutch and inertia brake, and (when specified) Gyrol fluid drive scoops. Upon request, extra control locations can be tailored for any requirement.

COMPLEMENTARY EQUIPMENT—Integrally mounted air compressor equipment for the rig control system is standard on National Drive Groups. Other drives for generators, dual air systems, etc. can be furnished to your specifications.

COMPLETE FACTORY TESTING—All National Drive Groups are assembled, lubricated and test run prior to shipment. Surfaces are protected by rust preventatives and all exposed surfaces are painted.

The National Representative in your area will be glad to give you more information on National Drive Groups, Rigs, and related equipment. Ask him soon.

National Auxiliary Drawworks Drive consists of a small fluid coupling, scoop controlled, mounted on a countershaft on the front engine frame. It permits all engines in a drive group **to operate as a single power unit while drilling.** But, at the same time, rotary speeds can be varied to meet all drilling needs.

A portion of the drive group for a National Type 55 Rig shows the National Torque Converter in operation. To protect the entire rig from shock loadings, National recommends the use of torque converters or hydraulic couplings.

More on the next page...

National Supply offers a complete rig-up service which insures faster starts in the field. Equipment boxed for export shipment is specially wrapped, sealed and weatherproofed against the conditions of passage and dock storage.

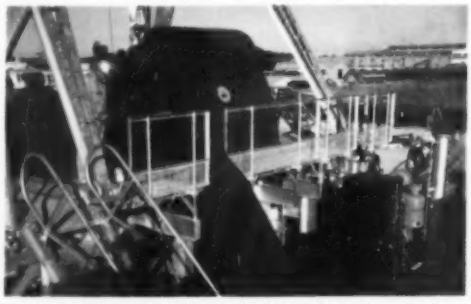
Save time and money with NATIONAL's rig-up service!

There's a *sure way* to be *fully* prepared for a new drilling job anywhere in the world—and National Supply's optional rig-up service provides it.

In either of our two special port center rig-up yards or your own equipment yard, we assemble—or direct the assembly of—the complete rig. Everything is positioned exactly as it will be used overseas. Then we test-operate, lubricate and adjust all components. Any problems that may cause initial delays at the well site are promptly solved. If you desire guide photographs and paint-coded parts for re-assembly, these are also supplied.

You can see how this rig-up service pays off for operations in remote areas, where services and parts are often days away. But it is also important for rigs closer to home—where even a short delay boosts estimated operating costs.

National has performed this time-and-money saving rig-up service for many years. We have a big list of satisfied customers who report *better rig-up time this way than with previous field assemblies*, and we will be glad to give you more details. Just contact the National representative in your area or our Export Division office in New York City.



If you desire guide photographs of machinery connections and paint-coded parts for re-assembly, these are also supplied.

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"You said a beakful!"

1,616-mile pipeline

the largest order ever placed for a protective pipeline coating of any kind specifies: POLYKEN

gets a modern coat

1.

2.

1. The Houston line is simultaneously cleaned and wrapped. Polyken Tape (dark spools) goes on, without a primer, in factory-uniform condition . . . then is overwrapped (gray spools).

2. Houston gets Polyken-wrapped pipe into the ditch almost immediately after coating. Field men say this makes for a tight, clean, fast spread.

Here's how the Houston Texas Gas and Oil Corporation decided on Polyken Tape for its 1,616-mile natural gas pipeline between Baton Rouge and Miami.

First, they confirmed Polyken's performance qualities for themselves. Their engineers gave it thorough corrosion-resistance tests. Then they designed comparative test spreads so they could see the actual difference in unit operations and costs between Polyken and the ordinary enamel method. Polyken passed with flying colors.

Next, they figured the job and estimated savings came to over half a million dollars. On one test spread, for example, Polyken cut the labor force from 36 men to 19, and construction equipment units from 18 to only 7.

On the job, Polyken is proving its superiority in other unexpected ways, too. Its "quick ditching" has been invaluable in slushy sand, where a fast-collapsing ditch calls for immediate coating and lowering. It has avoided the liabilities of excessive hot dope equipment and fumes in valuable orange groves and timberland.

These are just a few of the advantages of Polyken Tape —the modern way to coat a pipeline. Call your Polyken representative and get the full story on how Polyken can do a better job for you—and save you money.

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They Say—

It made the phone ring

Dear Sir:

I would like to thank you for the fine write up of our project in the March 9 issue of The Oil and Gas Journal ("The Florida Pipeline, A New Concept in Gas Transmission," page 108).

It is another example of the very accurate and comprehensive reporting your magazine furnishes to the industry. You might be interested to know that, in addition to the favorable comments within our own company, we have received many calls from our friends in the industry in connection with the article.

W. J. Bowen
President
Coastal Transmission Corp.
Houston

Shell claims drilling record

Dear Sir:

With reference to the "They Say" column in the January 5, Journal ("Loffland Tops Russian 'Record'," p. 48), Shell Oil Co. Rig 20 easily tops the Soviet and Loffland Brothers claim for individual rig drilling records.

In 1953 this rig drilled 331,316 ft. in 354 days. The 98 wells completed in the Big Foot field of South Texas were at an average depth of 3,381 ft. This represented a completion every 3.7 days and the average footage per day of drilling was 937.9 ft.

Shell Oil Co.
New York

(Editor's note: The Loffland rig drilled 199,288 ft. in 1957. A Russian rig with 128,572 ft. of hole in 1 year, had previously claimed a world's record for a single rig.)

Uncle Sam—Landlord

Dear Sir:

I have read with a great deal of interest your special section on Alaska (Mar. 16). It has brought together in one place much important information on the current situation and the possibilities.

As the former chief counsel of the Bureau of Land Management, I was especially interested in the article, "Uncle Sam—Land'ord" (p. 112). Its general theme, a tightening of requirements, is correct. It is partially incorrect as to the 5% royalty rate for discoveries.

This special royalty rate was established by regulation. It is still effective as to any leases issued prior to July 3, 1958, and on which a discovery is made. Section 10 of Public Law 85-505 put an end to the granting of this rate as to future leases, unit plans, or development contracts.

In view of the high cost of exploration and drilling in Alaska, the restriction of this incentive may tend to slow down the progress of Alaska as an oil state.

Jacob N. Wasserman
Attorney
Washington

Unique line bears watching

Dear Sir:

I was particularly interested in the description on page 82 of your March 16 issue regarding Freeport Sulphur Co.'s submarine line. The installation, as proposed, is unique.

I trust your pipeline editors will keep this project under close observation and that we may have further articles describing exactly how the line was finally installed.

Harold S. Bell
Consulting Engineer
Summit, N. J.

Huntin' for the Hunton

Dear Sir:

On page 313 of your January 26 issue was an article concerning a recent Hunton gas-distillate discovery in Major County, Oklahoma. This article was extremely interesting to me, due to the fact that in August, 1958, I completed a thesis study on the subsurface stratigraphy of the Hunton in northwestern Oklahoma.

While the thesis is fairly straightforward in its approach, it does contain one idea which I consider very important to any exploration for Hunton production in northwestern Oklahoma. Simply stated, it is this: Hunton exploration should be confined to the Bois d'Arc pinchout rather than the wedge-edge of the Hunton group itself.

As you know, search for a new West Edmond or Short Junction field has continued for many years in northwestern Oklahoma. The search has been singularly unsuccessful because

Engineered Economy

designed in ... built in ... kept in

..... one is best for you

Each Mission Mud Pump Valve is best for its service; one is best for your service. And more than that, each has been tested under conditions worse than anything met in the field. These valves have stamina designed in, built in, and *kept in* with special long-life rubber compounds, advanced metallurgy. Because they're better, they'll cut replacement cost, increase efficiency of pump operation.

Mission MUD MONARCH® Mud Pump Valves *for extremely high and medium pump pressures.* Unique design with exclusive seal ring results in exceptional performance as this ring seals effectively even when body and seats are severely worn.

Mission SUPER-SERVICE® Mud Pump Valves *for medium pump pressures.* Four crossarms provide extra strength and large striking surface, assuring long valve seat life without restricting flow area.

Mission SILVER TOP® Mud Pump Valves *for low and medium pump pressures.* Replaceable, wear-taking bushing greatly reduces valve seat replacement costs. The famous Compound 308® inserts are interchangeable with Mission Super-Service Valves.

Mission Mud Pump Valves are available for all popular makes of mud pumps. Buy them anywhere through your supply store.

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Small rotary cuts drilling costs 60%

with USS Tiger Brand, America's No. 1 Wire Rope

Still in good condition. Tiger Brand Wire Rope after drilling 20 wells for a total of 18,000 feet.

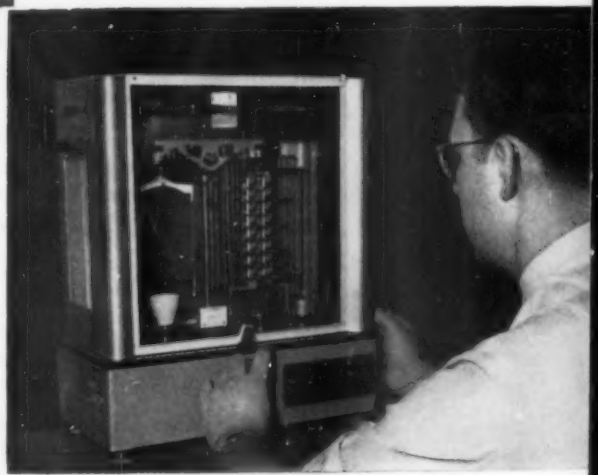
"This rig is averaging a 1000-foot hole every 40 hours at a cost less than 40% of the original cable-tool method of drilling in this area." These are the words of the owner, Mr. Kenneth C. Keas, Chanute, Kansas.

He goes on to say, "To operate in the shallow pay area (800 to 1100 feet) in which I drill, it is necessary to have a small, highly mobile rig. To operate profitably, it is vitally important to have top-quality equipment. From past experience, I chose USS American Tiger Brand Wire Rope and I can assure you it is more than carrying its share of the load."

When these photos were taken, the rig was equipped with 450 feet of ⅞" Tiger Brand 6 x 19 right lay, fiber core Monitor Excellay Rotary Drilling Line. It had drilled 20 wells for a total of 18,000 feet. Close examination showed the rope was still in excellent condition.

Tiger Brand Rotary Line is made from USS steel which has the best combination of strength, toughness and wear resistance to give lasting service. What's more, the design is right for rugged oil-field use. You can get Tiger Brand from leading supply stores throughout the oil fields or, for information, write to American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.

USS and Tiger Brand are registered trademarks



Why Tiger Brand is your best buy

1. It is made by a company that maintains the most complete wire rope research and manufacturing facilities in the country.
2. It is designed by one of the country's largest staffs of wire rope engineers. It is serviced by thoroughly experienced field representatives always ready with their assistance.
3. Every type of Tiger Brand Wire Rope is designed for specific applications. You get the *right* rope for the job.
4. It is made by *one* company, U. S. Steel, and every step of production, from ore to finished product, is carefully controlled and supervised to guarantee *one* high standard of quality.
5. Tiger Brand Wire Rope is manufactured by the largest single producer in the country.

American Steel & Wire Division of United States Steel

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Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors
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it was conducted in search of Bois d'Arc production in an area where no Bois d'Arc stratigraphy was present.

Marvin L. Oxley
Lone Star Producing Co.
Shreveport, La.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

APRIL

6-7 Instrument Society of America, second national symposium on chemical and petroleum instrumentation, St. Louis.

7-8 Sixth Gas Compressor Institute, sponsored by University of Kansas and Southwest Kansas petroleum industry, Randall's Cafeteria, Liberal, Kans.

7-9 Petroleum Industry Electrical Association, Petroleum Electric Supply Association, thirty-first annual conference and exhibition, Moody Center, Galveston, Tex.

9 Illinois Oil and Gas Association, fourteenth annual meeting, Moose Lodge, Mount Vernon, Ill.

8-9 Western Petroleum Refiners Association, computer conference, Hotel Tulsa, Tulsa.

8-10 American Petroleum Institute, Division of Production, eastern district meeting, Penn-Sheraton Hotel, Pittsburgh.

14 Independent Oil Men's Association of New England, annual meeting. Hotel Statler, Boston.

14-16 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

15-17 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

15-17 American Petroleum Institute, Division of Transportation, annual tanker conference, Jung Hotel, New Orleans.

16-17 Rocky Mountain Oil and Gas Association, midyear meeting, Casper, Wyo.

16-17 Oklahoma State University, sixth annual heat-transfer conference, Stillwater, Okla.

16-18 Roswell, N. M., Geological Society and Permian basin section of Society of Economic Paleontologists and Mineralogists, joint field conference and SEPM technical session, Desert Aire Motel, Alamogordo. N. M.

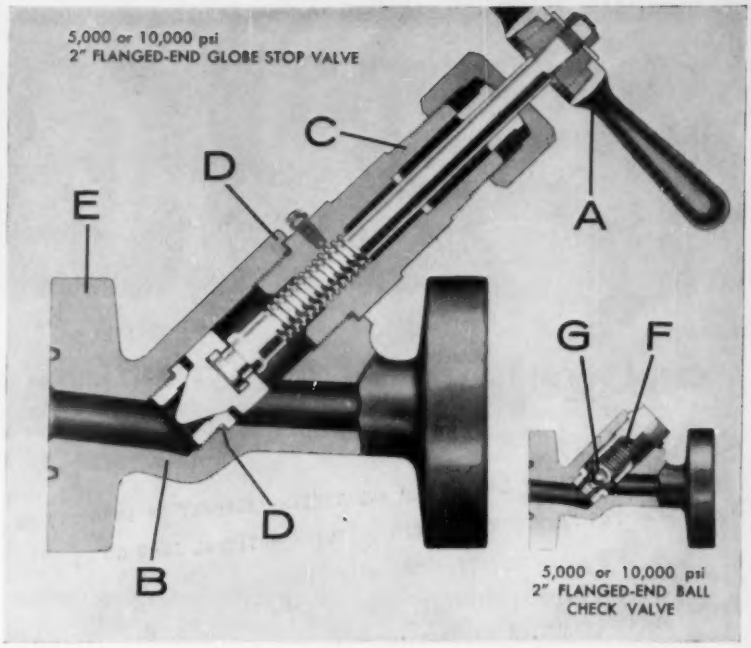
17-18 Colorado School of Mines, twenty-fifth annual Engineers' Day, Golden, Colo.

18-22 Petroleum Equipment Suppliers Association, twenty-fourth annual meeting, Boca Raton Hotel and Club, Boca Raton, Fla.

19-23 American Society of Mechanical Engineers, oil and gas power conference and exhibit, Shamrock-Hilton Hotel, Houston.

22-24 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Herring Hotel, Amarillo, Tex.

22-24 Natural Gasoline Association of America, thirty-eighth annual con-



New Edward High-pressure Valves for Petroleum Services

New high-pressure, *flanged-end* valves from Edward are designed to give you longer, more dependable service for many petroleum industry applications requiring highest quality in forged steel valves: high pressure heaters, treaters and separators, high-pressure vessel blow-down; headers and flow lines; bypass lines; unloading in compressor stations; blow-out preventer manifolds; throttling services; and many other similar petroleum industry applications.

NEW GLOBE STOP VALVES—There are two new Edward flanged-end, globe stop valves: one for pressures to 5,000 lb WOG at 300F (10,000 psi test); and one for pressure to 10,000 lb WOG at 300F (15,000 psi test). Both valves have the exclusive cross-arm style Impactor handle* (A) that makes closing against high pressure much easier, eliminates need for "cheaters." Valve body (B) is drop forged of chromium-molybdenum alloy steel to exacting requirements for maximum ruggedness and long life under toughest service conditions. The inclined bonnet (C) facilitates streamlining of flow passages, reduces pressure drop and wear-producing turbulence. Metal gaskets (D) and buna-N "O" rings assure tight, leak-proof fit between body and bonnet and between seat and body. Flanges (E) are forged integral with body and faced according to A.P.I. Standard 6B.

New globe stop valve Figs. 5158 and 9158

New ball check valve Figs. 5160 and 9160

NEW BALL CHECK VALVES—In the same pressure classes as the new stop valves, are two new forged-steel, ball check valves. These new check valves have the same general construction plus stainless steel spring (F) and 16% chromium stainless steel ball disk (G) for tight seating. Seat and ball disk are replaceable.

To get the complete story, plus ratings and dimensions, on new Edward flanged-end valves, write for Bulletin 584. Edward builds a complete line of cast and forged steel valves for pressures to 10,000 lbs, with flanged, screwed, socket, or butt welding ends. For additional information, see your favorite distributor, or write Edward Valves, Inc., 1212 West 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company. *T.M. Reg. U.S. Pat. Off.

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VERY GOOD
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Thank our friends and customers for their acceptance of Q-BROXIN. It expresses their confidence in the product, and in Baroid's ability to help solve their drilling mud problems.

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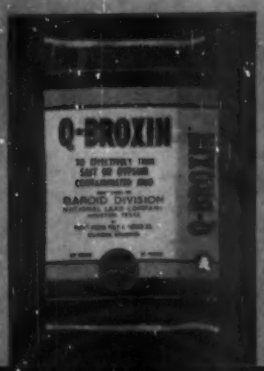

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vention, Baker and Adolphus Hotels, Dallas.

23-24 Sixth annual West Texas oil lifting short course, Texas Technological College, Lubbock, Tex.

24 Society of Petroleum Engineers of AIME, Gulf Coast drilling and production practices meeting, Lafayette, La.

24-25 Society of Economic Paleontologists and Mineralogists, Pacific Coast section, annual spring field trip, Boulder Creek area of Santa Cruz Mountains, California.

25 American Institute of Chemical Engineers, annual joint Oklahoma state meet, Engineering Auditorium, Oklahoma State University, Stillwater, Okla.

26-28 Texas Independent Producers and Royalty Owners Association, membership meeting, Baker Hotel, Dallas.

27-28 Society of Exploration Geophysicists, annual midwestern meeting, Cortez Hotel, El Paso, Tex.

29-30 Western Petroleum Refiners Association, Southwest regional technical-industrial relations meeting, Hotel Paso del Norte, El Paso.

29-30 Pacific Coast Gas Association, operating section, transmission conference, El Mirador Hotel, Palm Springs, Calif.

30-May 1 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

30-May 2 Fort Smith, Ark., Geological Society, field trip and conference on Western Arkansas Valley gas area, registration, April 30, Ward Hotel, Fort Smith.

MAY

1 Fourth annual petroleum accounting conference, sponsored by Wichita chapters of the Petroleum Accountants' Society of Kansas, National Association of Accountants, the Kansas Society of Certified Public Accountants, and the University of Wichita, Lassen Hotel and University of Wichita campus, Wichita.

3-6 Liquefied Petroleum Gas Association, twenty-eighth annual meeting and trade show, Conrad Hilton Hotel, Chicago.

4-5 American Society of Mechanical Engineers, maintenance and plant engineering division conference, Edgewater Beach Hotel, Chicago.

4-5 Independent Petroleum Association of America, midyear meeting, Westward Ho Hotel, Phoenix.

4-7 American Geophysical Union, annual meeting, Washington.

5-7 Purdue University, fourteenth Purdue industrial-waste conference, Purdue Memorial Union Building, Lafayette, Ind.

6-7 Panhandle Producers and Royalty Owners Association, annual meeting, Amarillo, Tex.

6-8 American Petroleum Institute, Division of Production, Rocky Mountain district meeting, Gladstone, Henning, and Townsend hotels, Casper, Wyo.

7-8 Society of Petroleum Engineers of AIME, Permian Basin section oil recovery conference, Midland, Tex.

7-8 Rocky Mountain Oil and Gas Association, refining committee annual meeting, Petroleum Club Building, Denver.

13-15 American Petroleum Institute, Division of Transportation, annual pipeline conference, Pittsburgh.

13-15 Canadian Institute of Mining and

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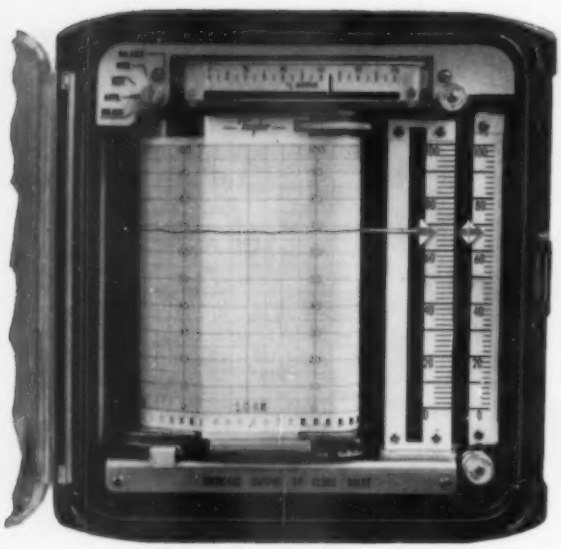
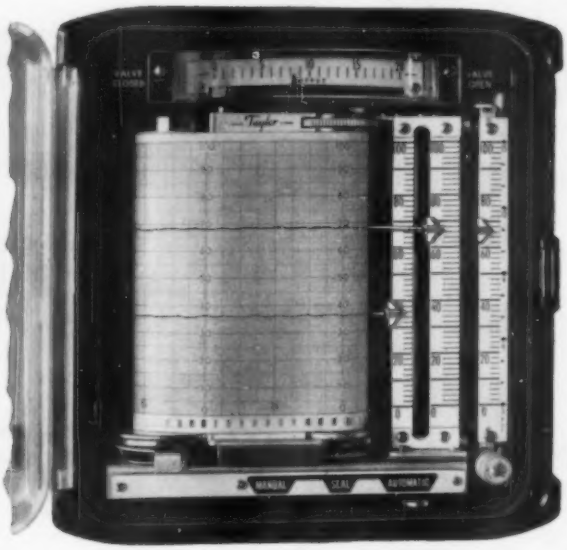
California Building.

All Process Engineers: Compare Features of the New Taylor Electronic AC or DC Recorder and the exceptional TRANSCOPE* Pneumatic Recorder (90-J)



701J AC or DC Electronic Recorder



90J Transcope Pneumatic Recorder

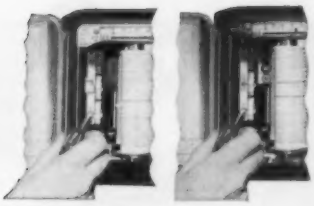
NEVER BEFORE SO MANY FEATURES IN SO LITTLE PANEL SPACE

1. Unconfused Readability. Because chart record, pen and set-point are side-by-side, whether electronic or pneumatic. Target-type pens and pointers are easiest of all to see, even at a distance. The 4″ chart reads from left to right—like a newspaper—on rectilinear coordinates. Thus, operators are encouraged to make frequent readings . . . and they make fewer mistakes because all pertinent data is lined up.

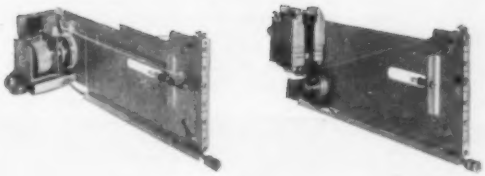
*Reg. U.S. Pat. Off.

LOOK TO TAYLOR FOR

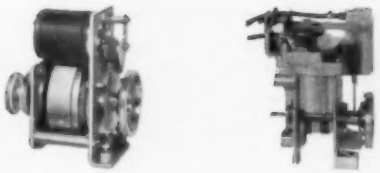
Taylor Instruments



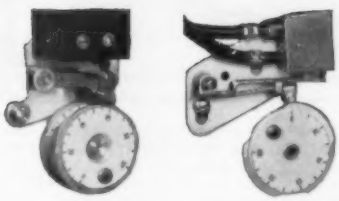
2. Front Adjustments—a Taylor 'first'. Controller response adjustments are quickly and easily made from the front, where results can be watched, on both Electronic (left) and Pneumatic (right) instruments. You can visualize immediately all pertinent process information—record, pen and set point.



3. Plug-in Set Point Transmitters, parallel to and exactly matching chart range, permit comparison without confusion and accurate adjustment of the control point. Separate set point transmitter enables you to stay on fully automatic control, even when recorder slide is removed.



4. Powerful Servo Motors give more precise pen positioning than ever before. More accurate records. Unmatched threshold sensitivity. Unparalleled power permits use of process alarms, new inking system and elimination of flimsy linkage.



5. Built-in Process Protection. Integral heavy duty alarms can be standard or hermetically sealed for Class I, Group D, Div. 2. Each cam may be set for high or low level or high-low. Contacts can be normally open or normally closed. "Memory Pointers" indicate *magnitude* beyond the alarm setting of the process variable. Cost is substantially less than conventional systems.

See your Taylor Field Engineer or write for appropriate Bulletin.
Taylor Instrument Companies, Rochester, N. Y., and Toronto, Ontario.

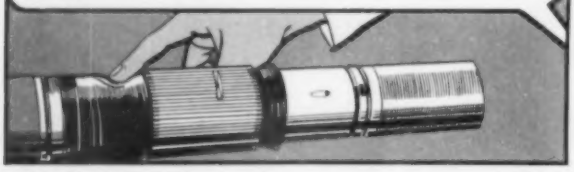
VISION • INGENUITY • DEPENDABILITY

MEAN ACCURACY FIRST

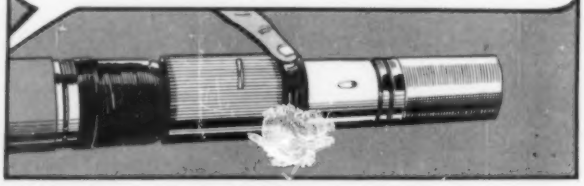
HERE'S A REPORT ON THE DURABILITY OF THE RUBBER-TYPE ELEMENTS USED IN OUR TYPE OF GAS LIFT VALVES — AND HOW THE DESIGN PRINCIPLE SAVED A SOUTH TEXAS WELL OWNER THE COST OF A CONVERSION WORKOVER.

THE VALVES COVERED BY THIS REPORT HAVE BEEN IN THE WELL FOR 5 YEARS NOW — AND HAVE GIVEN PERFECT SERVICE. WHAT'S MORE, THEY SAVED THE OPERATOR THE COST OF A WORKOVER JUST THREE MONTHS FOLLOWING INSTALLATION, WHEN THE WELL HAD TO BE CONVERTED FROM CONTINUOUS TO INTERMITTENT LIFT. THE WELL HAS BEEN PRODUCED INTERMITTENTLY SINCE THAT TIME AND THE WELL OWNER IS PLEASED WITH THE OPERATION OF THE VALVES.

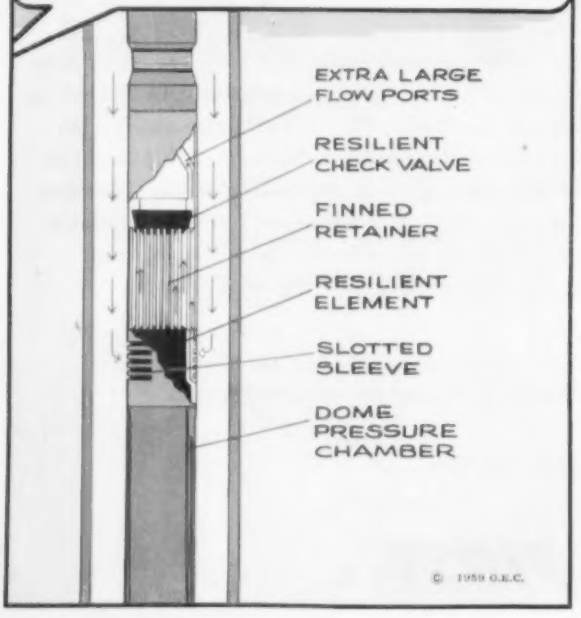
HERE, LET ME SHOW YOU THE MANY ADVANTAGES OF THE RESILIENT ELEMENTS IN OUR VALVES. FIRST, BECAUSE THIS MAIN ELEMENT IS RESILIENT, IT RESISTS EROSION FROM THE SYSTEM GAS. SECOND, THE FLOW AREA ACROSS THE ELEMENT IS THE LARGEST FLOW AREA OF THE VALVE, WHICH NOT ONLY HELPS TO REDUCE ANY CUTTING ACTION FROM THE SYSTEM GAS BUT MINIMIZES THE MOVEMENT REQUIRED TO ADMIT GAS FROM THE ANNULUS DURING OPERATION. THESE FEATURES ARE DESIGNED TO PREVENT FATIGUE.



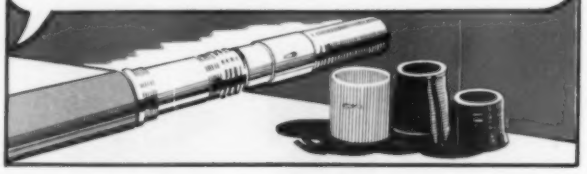
THE SAME PRINCIPLES APPLY TO THE CHECK VALVE HERE. IT COMPRESSES JUST SLIGHTLY AS GAS PASSES OVER IT, THEN — WHEN NECESSARY TO CHECK BACK PRESSURE FROM THE TUBING — IT FORMS A BUBBLE-TIGHT SEAL AGAINST THE FINNED RETAINER AND INSIDE WALL OF THE VALVE. AND THE RUBBER-TO-METAL SEAL PRINCIPLE OF BOTH RESILIENT ELEMENTS ELIMINATES THE EXCESSIVE WEAR NORMALLY ASSOCIATED WITH METAL-TO-METAL, STEM-AND-SEAT TYPE VALVES.



I'LL SHOW YOU HOW WE BOND THE MAIN VALVE ELEMENT TO THE VALVE MANDREL ASSEMBLY IN A MINUTE — BUT FIRST LET ME SHOW YOU THIS FLOW DIAGRAM OF OUR TYPE C GAS LIFT VALVE. PRESSURE FROM THE VALVE DOME HOLDS THE MAIN VALVE ELEMENT CLOSED ACROSS THE SLOTTED PORTS. WHEN GAS PRESSURE IN THE ANNULUS EXCEEDS THE SET PRESSURE OF THE VALVE, THE MAIN VALVE ELEMENT OPENS. WHEN THE PRESSURE FROM THE ANNULUS DROPS BELOW THE SET PRESSURE OF THE VALVE, THE VALVE CLOSES.



NOW HERE'S HOW WE BOND THE MAIN VALVE ELEMENT TO THE VALVE MANDREL ASSEMBLY. FIRST WE SERRATE THE SEALING SURFACES OF THE MANDREL ASSEMBLY TO GIVE IT A SUPERIOR BONDING SURFACE. THEN WE APPLY A SPECIAL BONDING CEMENT, SLIP THE RUBBER ELEMENT INTO PLACE, AND BAKE THE COMPLETE ASSEMBLY FOR ONE HOUR AT 375° F. THIS PRODUCES A PRESSURE-TIGHT SEAL AT THE ELEMENT END OF THE DOME CHAMBER. AS A RESULT, OUR VALVES CAN BE EXPECTED TO MAINTAIN THEIR SET PRESSURE INDEFINITELY.



IF YOU'RE PLANNING A NEW GAS LIFT INSTALLATION AND WANT TO **RUN VALVES THAT WILL STAY IN THE HOLE** AND GIVE YOU TROUBLE-FREE SERVICE — **INSTALL OTIS GAS LIFT VALVES.** THEY HAVE NO METAL MOVING PARTS . . . NO BELLOWS TO FATIGUE . . . NO METAL SEATS TO CUT OUT . . . AND THEY'RE DESIGNED TO OPERATE CONTINUOUSLY OR INTERMITTENTLY WITHOUT HAVING TO BE PULLED FOR CONVERSION. CONTACT ONE OF OUR GAS LIFT SPECIALISTS AT THE OTIS OFFICE NEAREST YOU. HE'LL BE GLAD TO SHOW YOU THESE AND OTHER EXCLUSIVE FEATURES AND EXPLAIN HOW OTIS GAS LIFT VALVES ARE DESIGNED TO SAVE YOU MONEY.

Otis - "First in Gas Lift Control"

OTIS

OTIS ENGINEERING CORPORATION

General Offices: 5812 Denton Drive Dallas

Branches Throughout the Oil Country

Metallurgy, tenth annual technical meeting of the Petroleum and Natural-Gas Division, Macdonald Hotel, Edmonton.

14-23 International Petroleum Exposition, Tulsa.

25-27 Chemical Institute of Canada, forty-second annual conference, Halifax, N. S.

25-27 American Society for Quality Control, annual convention and exposition, Public Hall and Hotel Sheraton Cleveland, Cleveland.

25-28 American Society of Mechanical Engineers, machine-design division, design-engineering conference, and Clapp & Poliak, Inc., design-engineering show, Convention Hall, Philadelphia.

27-29 American Petroleum Institute, Division of Marketing, midyear meeting, Savery Hotel, Des Moines.

27-29 Southern Gas Association, fourteenth annual short course in gas technology, Texas College of Arts & Industries, Kingsville, Tex.

27-30 American Petroleum Institute, Division of Refining, midyear meeting, Statler Hotel, New York.

30-June 5 Fifth World Petroleum Congress, Coliseum, New York.

JUNE

2-4 Appalachian Underground Corrosion Short Course, University of West Virginia, School of Mines, Morgantown, W. Va.

4-5 Kentucky Oil and Gas Association, annual meeting, Phoenix Hotel, Lexington.

8-9 University of Michigan, School of Public Health and College of Engineering, short course on industrial water conservation, Ann Arbor, Mich.

10 American Association of Oil Well Drilling Contractors, tristate chapter, annual safety clinic, Carmi, Ill.

10-12 Instrument Society of America, second international symposium on gas chromatography, East Lansing, Mich.

10-13 American Association of Petroleum Landmen, fifth annual convention, Skirvin Hotel, Oklahoma City.

14-18 American Society of Mechanical Engineers, semiannual meeting, Chase and Park Plaza Hotels, St. Louis.

14-19 Society of Automotive Engineers, summer meeting, Chalfonte-Haddon Hall, Atlantic City.

15-17 Interstate Oil Compact Commission, midyear meeting, Roosevelt Hotel, New Orleans.

21-26 American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City.

21-26 Air Pollution Control Association, annual meeting, Statler Hotel, Los Angeles.

22-23 Michigan Gas Association, Grand Hotel, Mackinac Island, Mich.

22-24 Canadian Gas Association, annual meeting, Empress Hotel, Victoria, B.C.

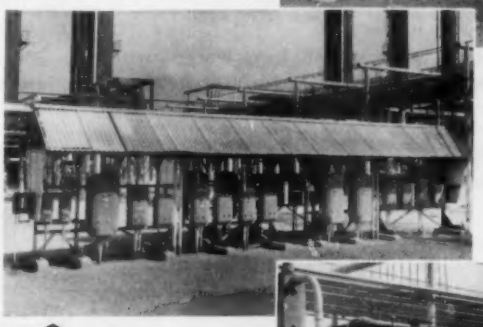
22-26 Gordon Research Conferences, petroleum, Colby Junior College, New London, N. H.

22-26 Massachusetts Institute of Technology, National Association of Corrosion Engineers, short course on fundamentals of corrosion reactions and corrosion control, MIT, Cambridge, Mass.

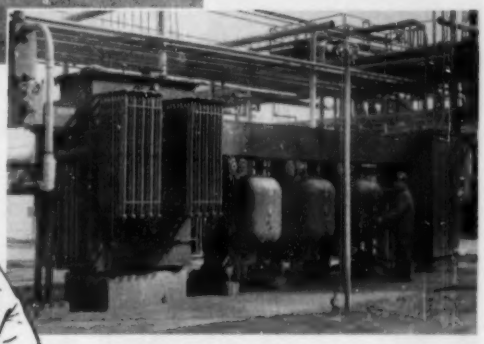
24-25 Western Petroleum Refiners Association, Mid-Continent regional technical-industrial relations meeting, Broadview Hotel, Wichita.

Right foreground: Nelson Class 1041, oil-immersed, 4160 volt motor starters

Left background: Nelson Class 497, factory-assembled switchrack, 480 volt



Nelson Class 497 switchrack with explosion-proof starters



Nelson 2000 KVA, double front, unit substation (explosion-proof)

Phillips Chemical Doubles Plant Capacity

Editors of a leading magazine recently published a six page article on how Phillips Chemical doubled the production capacity of its Plains Synthetic Rubber Plant. They told how it was done and stressed the importance of selecting quality equipment to assure a high degree of reliability. In addition to the equipment pictured Nelson furnished such vital equipment as motor control centers, explosion-proof circuit breakers, combination starters, control stations and lighting panels.

Nelson takes pride in building quality into every job. If you are looking for a source of electrical control equipment that puts pride of workmanship above all, may we suggest you contact your Nelson Sales Representative. Offices are located in principal cities throughout the United States.

P. S. If you would like a print of the article mentioned please send your request to the factory. It will be mailed promptly.

At Nelson . . . . *quality* comes first!

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

You are looking at a time machine

It sounds like science fiction: traveling across the continent in 4½ hours, going from New York to London in 6½, cutting airline schedules almost in half.

Yet these are routine for jet liners in the jet age — an era people at Standard's research laboratories have been working toward since the day seventeen years ago when we fueled the first U. S. jet flight.

Since then our scientists have worked with the armed forces to perfect fuels and special lubricants for planes that fly faster than sound, or cruise non-stop around the world. They've helped engine designers solve problems of heat and cold, in addition to aiding airlines with faster airport fueling systems.

The sum of these years of development has been to add hours to the traveler's day, days to the vacationer's week. So, in helping to harness time, as well as in putting petroleum to many other uses for you, ***the people at Standard are planning ahead to serve you better.***

STANDARD OIL COMPANY OF CALIFORNIA

the OIL AND GAS JOURNAL
TULSA, OKLAHOMA
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JOURNALLY SPEAKING

Nothing Else Like It

THE COST of oil-field machinery is currently 190% of the 1946 cost; the cost of valves and fittings is 250%; the wage cost for refinery construction is 224%.

Between 1956 and 1958 the wage cost for operating a refinery increased 5.4% but labor productivity increased only 0.3%.

Over a 20-year period the number of productive workers required to refine 10,000 bbl. of oil per day decreased markedly but the number of management and supervisory employes increased by almost exactly the same amount, so that the total number of employes was virtually unchanged.

Information such as this is vital to anyone in the oil business. But it's mighty hard to get if you try to dig it out yourself from a hundred different sources.

The man who made it easy to get has just won an award for his efforts.

He is W. L. Nelson, the Journal's technical editor. The award was given by the Associated Business Publications "for outstanding editorial accomplishment." The effort was Nelson's series on "Costimating" which has been running in the Big Yellow Book almost every week since 1949.

Nelson is the only man on the Journal's editorial masthead who isn't a full-time employe. The reason is that he is also a professor of refinery engineering at University of Tulsa and in addition takes on consulting assignments for refining companies and various foreign governments. This makes him a triple-threat man, and puts him in an admirable position to know what sort of information oil operators need and how to get it.

If you're just an average reader of the Journal, you probably haven't paid much attention to the Costimating page and the Nelson Index. Admittedly they aren't "leisure reading," and their tables of figures don't look very inviting.

But if you have any occasion to wonder how much it will cost to build a new plant or to install and operate a new piece of equipment, you'll find Nelson's assemblage of material worth its weight in gold.

It all started in this way:

Formerly when an engineer estimated the cost of a new unit such as a gasoline plant or a fractionating tower he had to dig through dozens of current price lists. Once assembled, this information might be of little value in estimating the cost of a somewhat different type of unit, and in any event it would be out of date within a year or two.

So Nelson conceived the idea of maintaining a permanent index of all principal components of processing plants. He converts current prices into index figures related to a base year —1946 for construction items and 1956 for operating items.

Now, if you built a unit several years ago and want to know how much it would cost to replace it today, Nelson's Costimating index will give you the answer in a hurry. By checking against the various components you can quickly calculate that it will cost X% more.

That's only one example of the many uses for the Costimating series. Nelson has received many plaudits and praises from users of his material. Two years ago the American Association of Cost Engineers gave Nelson its first Award of Merit "for outstanding contributions in the field of cost estimating."

The Nelson Costimating series takes several forms in the Journal. The current weekly series is on process operation, and No. 44 in this series appears on page 158 of this issue.

An itemized cost index is compiled every 3 months, and the current quarterly index can be seen on page 166 of this issue.

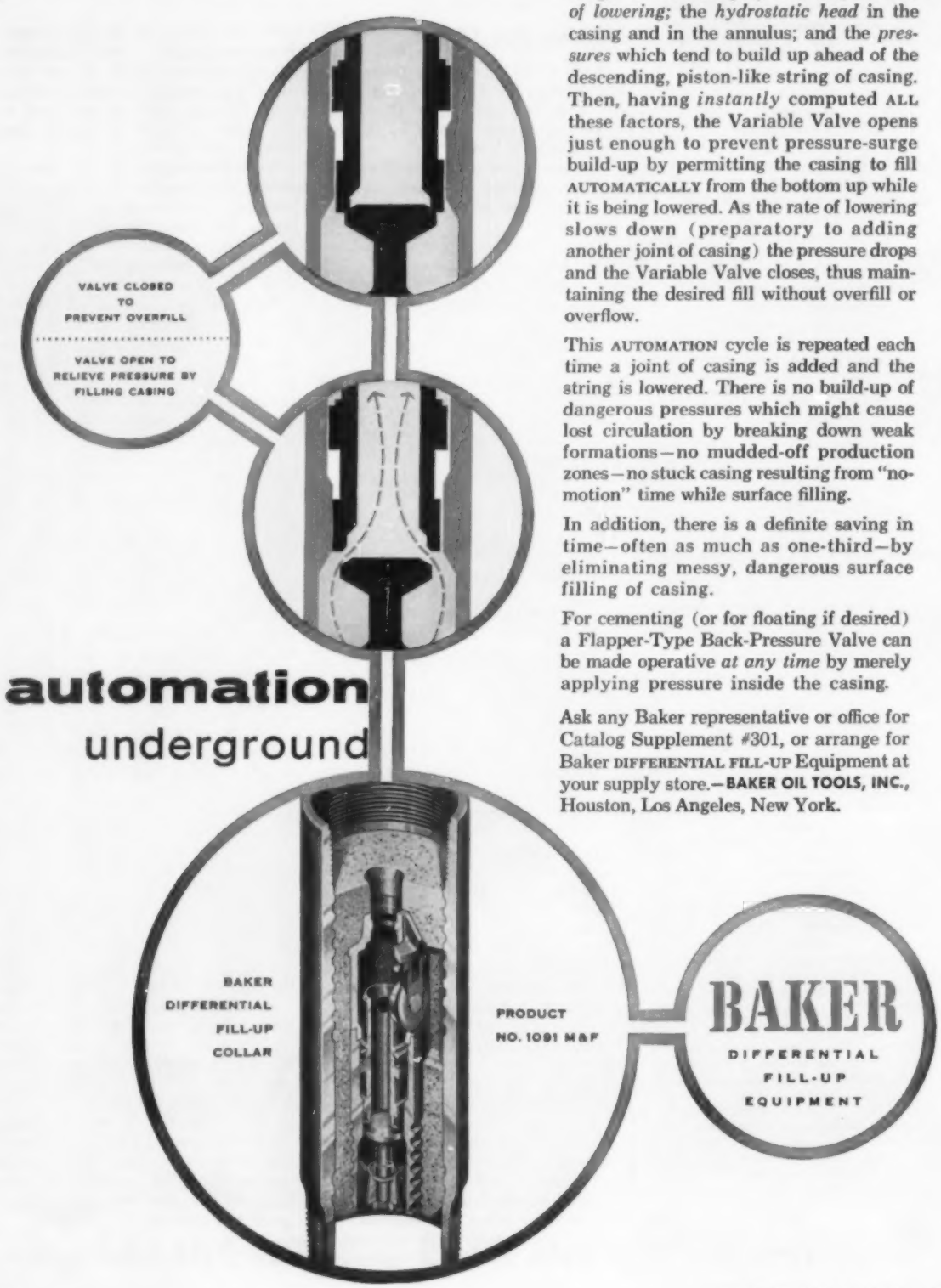
In the first issue of each month we run a condensed "Nelson Refinery Construction Cost Index." It shows up this week on page 156.

In our annual Review and Forecast number we plot the long-range trends in the principal cost items of processing equipment. For what has happened to costs since 1946, refer back to page 153 of our January 26 issue.

Finally, for those who came in late, or who failed to clip and file every installment, our Reader Service Department sells (at $2.50 per copy) a 70-page reprint of the most pertinent of Nelson's 10-year series.

We're proud that "W.L." has received official awards for his series. But we're even prouder that our readers recognize it as an invaluable working tool and the only thing like it published anywhere.

—Henry D. Ralph



THE VARIABLE VALVE in Baker Differential FILL-UP Equipment is an amazing example of "down-hole" AUTOMATION. As a string of casing is lowered in the well, this valve AUTOMATICALLY takes into account the *weight and viscosity of the mud;* the *rate of lowering;* the *hydrostatic head* in the casing and in the annulus; and the *pressures* which tend to build up ahead of the descending, piston-like string of casing. Then, having *instantly* computed ALL these factors, the Variable Valve opens just enough to prevent pressure-surge build-up by permitting the casing to fill AUTOMATICALLY from the bottom up while it is being lowered. As the rate of lowering slows down (preparatory to adding another joint of casing) the pressure drops and the Variable Valve closes, thus maintaining the desired fill without overfill or overflow.

This AUTOMATION cycle is repeated each time a joint of casing is added and the string is lowered. There is no build-up of dangerous pressures which might cause lost circulation by breaking down weak formations—no mudded-off production zones—no stuck casing resulting from "no-motion" time while surface filling.

In addition, there is a definite saving in time—often as much as one-third—by eliminating messy, dangerous surface filling of casing.

For cementing (or for floating if desired) a Flapper-Type Back-Pressure Valve can be made operative *at any time* by merely applying pressure inside the casing.

Ask any Baker representative or office for Catalog Supplement #301, or arrange for Baker DIFFERENTIAL FILL-UP Equipment at your supply store.—**BAKER OIL TOOLS, INC.,** Houston, Los Angeles, New York.

Washington can't keep oil prices from rising

DON'T BE TOO CONCERNED over the "price surveillance" provision of the imports-control order. Fears that it means detailed regimentation of the oil industry are exaggerated and premature.

Let's go right ahead and run our business as though we owned it. Set prices according to market conditions, and try to work them up toward parity with rising costs.

The imports order gives the administration absolutely no control over anybody's price for crude or a refined product. "Surveillance" means nothing but watching, and Washington has always watched oil prices.

THE SURVEILLANCE PROVISION is unfortunate and unnecessary. It is unfortunate because it gives oil's political enemies the idea that the federal Government has a lot more authority over prices than it actually possesses. It provides an entering wedge for political pressure to twist "surveillance" into "harassment" under some future administration.

It is unnecessary because this country's capacity to produce and refine oil is much greater than the prospective demand for the next 2 or 3 years, at least. The competition of surplus oil to share in the market will provide an automatic brake to keep prices from rising unreasonably.

But there may be a bright side to this surveillance provision. The President's proclamation directs the OCDM and a special cabinet committee to determine whether higher prices are necessary to the national security objectives of the law under which imports were limited.

This could be interpreted as removing oil price consideration from Congress and other federal agencies and confining it to the high realm of national defense. Certainly oil men can answer price critics by saying that the subject lies entirely in the hands of the cabinet.

This cabinet group is not going to bother with any local price change. Its concern is only with the national level of petroleum prices. And if it concludes that the level is too high it can do nothing but recommend that national security requires greater dependence on imports.

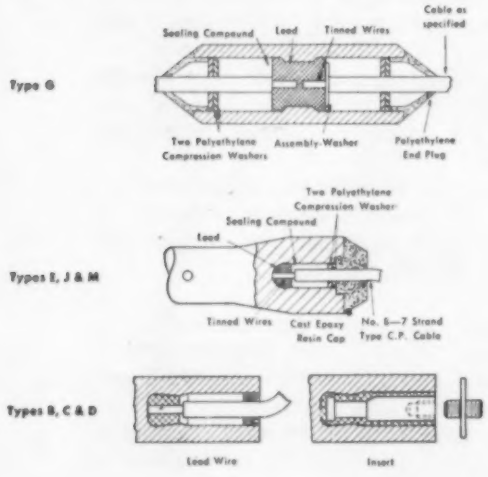
It is quite possible for the cabinet group to conclude that higher oil prices are necessary for the security objective of a healthy domestic industry. A healthy industry means a prosperous industry, and that means prices that recover costs and give a profit incentive to develop more oil.

OIL PRICES in the United States have been too low by any yardstick. Efforts to get them up to a profitable level have been thwarted by the flood of low-priced imports. The administration has now said this condition is a danger to security, and has put a damper on imports.

This is an implied invitation to the industry to get its price structure in order and to let prices rise where economically justified. The coming months promise much improvement in the supply-demand balance, and the industry should work its prices upward commensurately.

DURIRON® IMPRESSED CURRENT ANODES

For more positive cathodic protection of all types of structures used throughout the petroleum industry, insist on DURIRON® ANODES. Duriron performs as well as graphite in all the easy services, and far outperforms graphite when the going gets tough in marshlands, at river crossings, or wherever it is impractical to use backfill. Duriron anodes have proven their superiority for the protection of pipelines, drilling rigs, well casings, storage tanks, and similar structures. For real protection, get Duriron.



STANDARD ANODE SIZES

Type Anode	Size	Area Sq. Ft.	Weight (Lbs.)	General Application
B	1" x 60"	1.4	14	Fresh Water
C*	1½" x 60"	2.0	25	Ground Bed
D	2" x 60"	2.6	46	Ground Bed
E	3" x 60"	4.0	115	Salt Water
G	2" x 9"	0.4	5	Ducts
J	3" x 36"	2.5	80	Salt Water
M	2" x 60"	2.8	57	Salt Water

*Applicable also in fresh water service. Should not be used in ground beds without backfill.

THE DURIRON COMPANY, INC. / DAYTON, OHIO

DURCO

Import Quotas Assigned for Products

• Total allocations of residual fuel oil and other finished products are 45,000 bbl. daily less than expected. Control foes may delay court test.

IMPORTS of residual fuel oil during the second quarter will be limited to 347,311 bbl. daily under the first company quotas assigned last week by the recently established Oil Import Administration.

Quotas for imports of other finished petroleum products were set at 76,646 bbl. daily.

Total allocations for finished products amount to 423,957 bbl. daily. This is about 45,000 bbl. per day less than had been expected under the new import control program ordered last month by President Eisenhower.

The Government's unprecedented controls on oil imports went into effect on finished petroleum products April 1. Similar controls on crude and unfinished products became effective March 11, the day after the voluntary control program expired.

Licenses required . . . Capt. Matthew V. Carson, Jr., import administrator, said company quotas for finished products were based on their actual imports into the United States in 1957 and into Puerto Rico in the last half of 1958.

Import licenses have been issued, as required by the presidential proclamation, for all companies which have been assigned import quotas. The Bureau of Customs has been notified that, effective April 1, licenses will be required for all petroleum imports into the United States except by the Department of Defense.

Military quotas, though coming under the same general restrictions, are to be enforced under a special order from the President.

The quota system, limiting imports of finished products to their 1957 level, gives the Defense Department the lion's share of such allocations, excluding residual fuel.

The department's quotas for finished products other than residual account for more than 34,000 of the 76,646 bbl. daily allowed to come into Districts 1-5. The new military quotas represent a sharp cutback from the recent import level of more than 60,000 bbl. a day, however.

There have been reports that the Pentagon was seeking product allocations totaling about 70,000 bbl. daily. This total would include products stored in bond for use outside this country. Such products are not covered by the new import restrictions.

The leaders . . . Standard Oil Co. (N. J.) received a quota to import 104,210 bbl. per day of residual oil.

This is easily the largest individual quota issued. In addition, Jersey can bring in 13,590 bbl. of other finished products.

Its earlier quota of 49,120 bbl. daily for crude and unfinished products gives Jersey Standard the highest total allocation, amounting to 166,902 bbl.

Product Quotas by Companies

FINISHED-PRODUCTS ALLOCATIONS

(Other than fuel oil)
Effective Dates: Apr. 1-June 1

DISTRICTS 1-4

	Bbl. per day
Anchor Petroleum	5
Asiatic Petroleum	31
Department of Defense	30,554
Gulf Oil Corp.	2,723
Hess, Inc.,	3,234
Paragon Oil Co.	1,052
Pure Oil Co.	5
Royal Petroleum Corp.	1,476
Shell Oil Co.	9,789
Standard Oil (Calif.)	6,818
Standard Oil (N. J.)	13,590
Sun Oil Co.,	604
Western Solvents & Chemicals, Detroit	14
TOTAL	**69,895**

DISTRICT 5

Alaskan Propane, Fairbanks	35
Department of Defense	3,876
Fairbanks Plumbing & Heating, Fairbanks	9
Shell Oil Co.	186
Solar L. P. Gas Co., Spokane	10
Standard Oil (Calif.)	567
Time Oil Co., Los Angeles	2,068
TOTAL	**6,751**

RESIDUAL-OIL* ALLOCATIONS

Effective Dates: Apr. 1-June 1

DISTRICTS 1-4

	Bbl. per day
Ashland Oil & Refining	156
Asiatic Petroleum	702
Atlantic Refining	272
Ballard Oil Co., Hartford, Conn.	3,985
Belcher Oil Co., Miami	1,580
Buckley Bros., Bridgeport, Conn.	4,250
Central Petroleum, New York	3,187
Colonial Oil Industries, Savannah, Ga.	3,744
Department of Defense	1,375
Eastern States	7,112
Gulf Oil Corp.	2,019
Hess, Inc.,	38,928
Metropolitan Petroleum Corp.	20,986
New England Petroleum Corp., New York	8,523
Paragon Oil Co., Long Island City, N. Y.	54,423
Pure Oil Co.	403
Royal Petroleum Corp., New York	2,510
Shell Caribbean	12,719
Shell Oil Co.	4,014
Sinclair Refining	286
C. H. Sprague & Son, Boston	21,495
Standard Oil (Calif.)	1,102
Standard Oil (Indiana)	21,683
Standard Oil (Kentucky)	11,066
Standard Oil (N. J.)	104,210
Stuart Petroleum, Washington, D. C.	3,900
Texaco	850
Whale Oil Co., Brooklyn	301
White Fuel Corp., Boston	7,664
TOTAL	**343,445**

DISTRICT 5

Department of Defense	3,866

*Includes only fuel oil used as fuel.

per day in Districts 1-5 and an additional 604 bbl. daily for Puerto Rico.

Gulf Oil Corp., which received the highest quota for crude and unfinished products (76,060 bbl.), can import less than 5,000 bbl. daily of finished products under the 1957 formula.

In all, 29 importers were assigned quotas for residual fuel oil and 17 for other petroleum products.

Changes . . . Spokesman for the Interior Department, which embraces the new import agency, indicated that no changes in the finished-product quotas are expected until June 30. That's when the first allocation period ends.

Quotas for crude oil and unfinished products continue to fluctuate, however. The fluctuation is permitted under the presidential proclamation which set U. S. oil imports, other than residual fuel oil, at "approximately 9%" of total demand. An exception is allowed for crude imports to companies not having an adequate domestic supply.

Capt. Carson announced that additional quotas for crude and unfinished oils have been issued to three companies in Districts 1-4 and to one company in District 5. The newcomers bring to more than 150 the number of domestic refiners having such quotas.

New allocations are: Wolf's Head Refining Co., Oil City, 210 bbl. daily; Ida Gasoline Co., Shreveport, La., 22 bbl.; Bayou State Oil Corp., 86 bbl.; and Golden Bear Refining Co., Los Angeles, 810 bbl.

The OIA chief also reported that the allocation granted to West Branch Refineries has been transferred to its parent company, Osceola Refining Co., Grand Rapids, Mich.

Special treatment . . . Two companies have received special crude allocations on grounds that they do not have normal access to adequate domestic supplies.

They are Lakehead Pipeline Co. (330 bbl. daily) and Northwestern Refining Co. (11,937 bbl.).

Applications for special allocations of this type also have been received from Great Northern Oil Co.; International Refineries, Inc.; Murphy Corp.; Bay Refining Co.; and Socony Mobil Oil Co.

Last week's adjustments bring current permissible imports of crude oil and unfinished products to about 944,565 bbl. daily in Districts 1-5 and 80,147 bbl. in Puerto Rico.

The court test . . . A leading critic of the mandatory control program believes there will be no court test of the new system for some time.

PUERTO RICO ALLOCATIONS

	Bbl. per day
Crude and Unfinished Oil	
Caribbean Refining Co., San Juan	18,203
Commonwealth Oil Refining, Ponce	61,944
TOTAL	**80,147**
Residual Oil Used as Fuel	
Department of Defense	1,518
Standard Oil (N. J.)	497
TOTAL	**2,015**
Finished Products	
Department of Defense	406
Shell Co. (Puerto Rico)	57
Standard Oil (N. J.)	107
Tropical Gas Co., Miami	41
TOTAL	**611**

R. B. Kahle, board chairman of Eastern States Petroleum & Chemical Corp., Houston, said last week that opponents of the program would have a hard time getting into court at this time because the appeal board provided for has not been appointed.

The delay in a legal attack on the program has not, however, softened Kahle's attitude toward mandatory controls.

Kahle said he knows of no company which at this time is preparing to challenge the presidential executive order setting up the control program.

The program provides for a three-man appeal board composed of one official each from the Interior, Defense, and Commerce departments. The board will have authority to modify quotas or give quotas to those who do not have them. The board, however, must act within limitations set by the President.

Kahle said a company challenging the program in court at this time would face the technical obstacle of failing to exhaust all its administrative remedies, such as taking its case to the appeal board.

Kahle's opposition to the control plan stems partially from his belief that, contrary to the administration's position, the program "has absolutely nothing to do with security—it isn't a security matter."

Kahle also contends that inland refiners who will not refine their imports are being granted a "subsidy" by the Government through import quotas.

Push-Button Era Inaugurated

. . . at Texaco's Port Arthur refinery. Computer is given complete control of $4-million polymerization unit.

THE FIRST refining unit to be controlled and operated entirely by automatic instruments has gone on stream at Texaco's Port Arthur refinery.

Texaco claims the event marks the first time in history that an industrial process has been controlled by an electronic brain.

After 2½ years of preparation and work, Texaco engineers last week turned over control of a $4-million polymerization unit to a Thompson-Ramo-Wooldridge RW-300 digital computer.

What happens . . . Computers previously have been used to analyze data and perform calculations for control of processes.

But never before have they fed back their judgments to the plant and controlled its operations automatically on the basis of the calculations.

Actually what has happened is that for the first time in the history of automation the loop of a computer control has been closed on a full-scale plant operation.

Texaco employes and the manufacturer's technicians have spent 2½ years preparing the process for automation and 5 months preparing the computer model.

Texaco hopes to achieve an increase in efficiency of 6 to 10% through being able to operate the unit at the optimum pressure, temperature, and rate of throughput. One example of expected savings: A $75,000 yearly drop in the catalyst bill because of more efficient use of the catalyst.

A busy worker . . . The unit processes 15,000 M.c.f. of gas daily to produce 1,800 bbl. daily of blending fuel for the refinery.

The complex control program will gather information from 110 sources, control 16 different streams, pressures, and temperatures in nearly every combination possible.

The computer also will check the accuracy of its information, watch its own performance, type out what it is doing, and sound an alarm if danger or failure threatens.

In action, the instruments evaluate the variables and reset the plant's controls to conform to their judgment every 5 minutes for 24 hours a day.

SEVERAL WELLS have been drilled on Iniskin Peninsula.

OFFICIALS* of Alaska Consolidated visit well.

Alaska's Iniskin Area Tested Anew

- **Alaska Consolidated is drilling near two wells which were abandoned after having completion troubles.**

A DRILLING crew made hole below 3,300 ft. last week at the important 1 Antonio Zappa wildcat on the Iniskin Peninsula.

This deep test on the west side of Cook Inlet 160 miles southwest of Anchorage is more than just the ordinary battle of men against the Alaskan elements. For the first time, all modern drilling techniques are being concentrated in a test of an area which has attracted oil explorers since the first of this century.

The well was spudded on Christmas Day with a contract goal of 10,000 ft. The site had been selected last September on a unitized block of 58,000 acres with Alaska Consolidated Oil Co. of New York as unit operator.

The strategy . . . Primary objective of the well is to test various zones between 6,000 and 9,700 ft.

Previous tests have already demonstrated there are accumulations of oil and gas at these depths. The new group hopes that modern drilling techniques will overcome the detrimental features or handicaps of earlier tests.

The program will be characterized by:

. . . Continuous drilling through the winter to avoid potentially damaging shutdowns.

. . . Continuous logging and more frequent cores and formation tests to give a clearer picture of potential oil and gas zones.

. . . Use of special drilling fluids to obviate possibility of mud damage to porous zones.

. . . Use of hydraulic fracturing of the oil-saturated beds if this proves necessary.

Operators in addition plan to test shallow reservoir beds at a more favorable structural location than previously and also to prospect at depths never reached before.

The prospects . . . The Iniskin Peninsula has interested oil men since the early 1900's.

Even before that, Oil Bay, near the southern end of the peninsula, was named for oil seeps in the vicinity. At least three shallow wells were drilled near the seeps in the early part of the century. One of them reportedly had potential of 10 bbl. daily. Other seeps have been observed along the axis of the large anticline which extends for 13 miles along the peninsula.

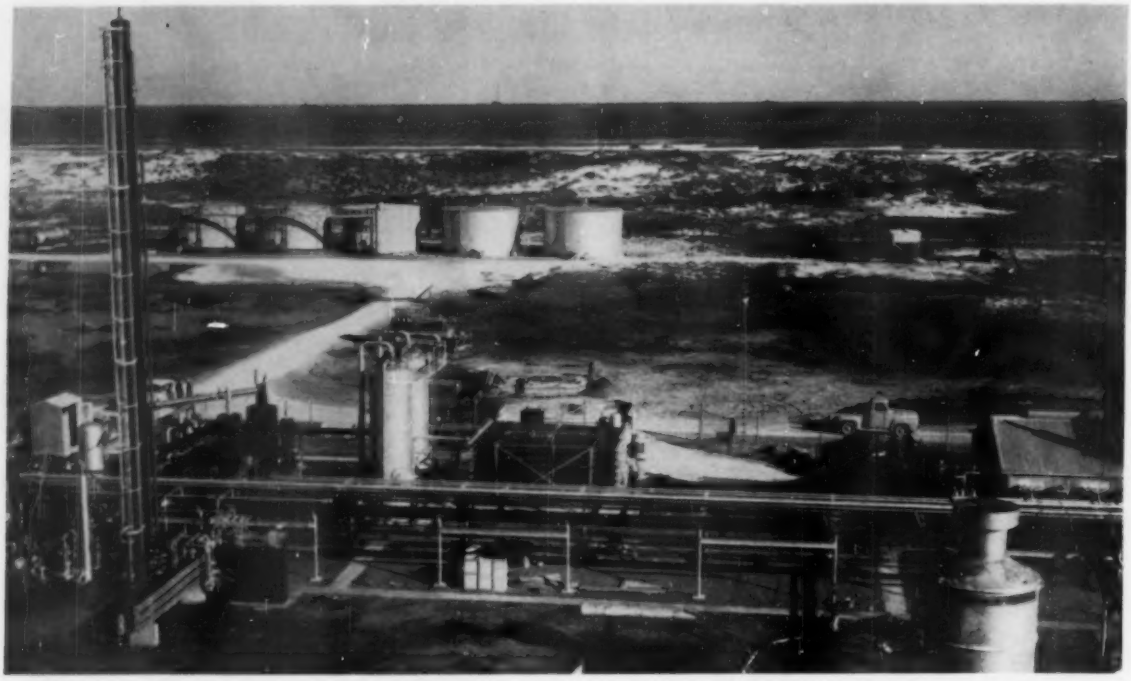
First modern wildcat in the region was drilled in 1936 by the Iniskin Bay Association, a group headed by Russel Havenstrite, as operator, and Carl Beal, geologist. The well was drilled to 8,750 ft. in two summers. It encountered excellent showings and actually produced high-gravity oil at rate of 5 to 10 bbl. daily. Mechanical difficulties, however, prevented a successful completion.

After the war, a new test, the 1 Beal, was begun in 1954 by the Iniskin Unit Operator, Inc. It was drilled to 9,745 ft. by the fall of 1955. It was cleaned out and logged. Later casing was run and the well tested at various levels.

The tests proved the presence of oil and gas from 6,300 ft. to the bottom of the hole. But the well has not proved commercial either because of low permeability of the oil-bearing rocks or because of adverse effect on them of the heavy mud column. The well is now flowing a small amount of gas and high-gravity oil.

Surface rocks in the Iniskin area and those penetrated by drilling thus far are of Jurassic age. The section is mainly shale with some sandstones.

*John Zappa, back to camera, president of Alaska Consolidated Oil, discusses wildcat with Charles Whitney, of Coastal Drilling Co.



BIGGEST of the pint-size plants is this Standard Oil Co. of Texas unit on Padre Island east of Kingsville, near Corpus Christi. It produces 120 bbl. daily of product from 47,000 M.c.f. and soon will be handling 70,000 M.c.f. daily.

Baby Gasoline Plants Going Big Time

• Only 110 short-cycle adsorbers have been built in the first 7 years since development, but more than 50 will be added this year. Reason for their popularity: They'll handle lean gas in small volumes profitably.

POCKET-SIZE gasoline plants which will make money in operations too marginal for conventional units are carving a sizable niche for themselves.

They are the short-cycle adsorption units, and their principal virtue is the ability to strip gas too lean for conventional units. They'll handle volumes of gas, rich or lean, as small as 1 million cubic feet per day, and make money.

Between 50 and 60 of the units will be installed this year—half again as many as the 110 that have been built since the first one was developed in 1952.

Two factors have triggered this surge.

... **Growing importance** of natural gas in the fuel picture.

... **Payout** of initial investment in 1 to 3 years.

This new tool has earned its spurs because:

... **It offers** operators a new revenue crop, extracting gasolines and other products which otherwise might be unclaimed.

... **It has** as one target 2 trillion cubic feet of gas now going annually to consumers, residential and industrial, without processing.

... **It provides** double-duty action, improving gas quality by drying as it siphons off salable products.

... **It bridges the gap** from the primary-purpose dehydration processes to the costlier, full-scale gasoline plants.

... **It is largely automatic,** provides its own fuel source, can be set up in 3 to 5 days and moved by truck to different sites for new assignments.

Four companies lead in the development. They are Parkersburg Rig & Reel Co., Delta Tank Manufacturing Co., National Tank Co., and Black, Sivalls & Bryson, Inc. A few units have been assembled by engineering firms.

A 7-year shakedown has rid the units of many bugs, but they still are in their infancy. Improvement and further refinements are under study and on the drawing boards.

Treatment of lean gas is their special forte.

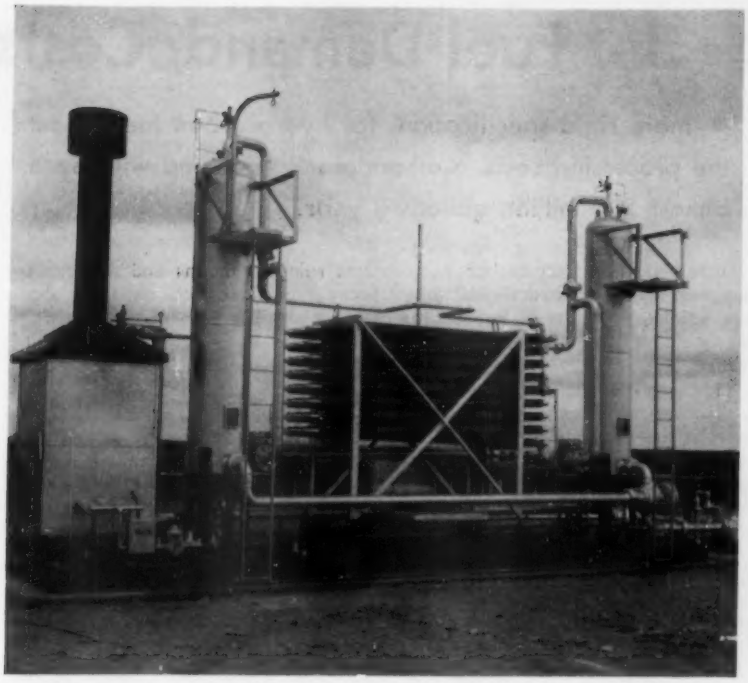
Even after wellhead and other preliminary processing by low temperature separation and refrigeration equipment, the short-cycle plants are capable of squeezing out still another profitable batch of products.

Most units now operate in Gulf coast areas of Texas and Louisiana. There are a few in Oklahoma, West Texas, and Canada. Installations will be made this year in California, Wyoming, and possibly other Rocky Mountain states.

Efficiency of the small adsorption plants is determined largely by temperature, cycling time and size of the desiccant beds. Composition of gas and pressures are lesser factors.

The units may be used in processing from 1,000 to 100,000 M.c.f. per day and more. Recoveries range from 10 to 500 bbl. of products daily. Use in combination with other processing tools has strong support from some oil and gas producers.

Example . . . One of the largest of



SMALLER of the junior units, near Lafayette, La., extracts 20 bbl. of liquid products daily from its 10,000 M.c.f. natural-gas stream.

the short-cycle adsorption plants was installed earlier this year for Standard Oil Co. of Texas on Padre Island, near Corpus Christi.

This unit has two towers, 72 in. by 15 ft. The regeneration gas heater is direct-fired, rated at 5 million B.t.u. per hour. The towers operate alternately on adsorbing, cooling, and heating cycles.

The unit operates unattended. Field personnel at intervals change charts, wind the clocks, and gage stock tanks.

Liquids are removed from gas which already has been processed first by low-temperature separation systems on offshore platforms and by a refrigeration unit on Padre Island.

Products of these three operations are commingled in a separator operating at 300 psi.

Early payout . . . In a smaller operation, a unit processing 8,000 M.c.f. is providing 17 bbl. of products daily. This brings about $2.75 a barrel or an approximate annual revenue of $16,000.

Initial investment, not counting expenses, would be recovered in about 24 months.

Operators also point out that in this type of breakdown, no charge nor credit is taken for dehydration of the gas.

Most of the more than 100 units now operating are of smaller types, producing about 20 bbl. of products daily from 8 to 12 million cubic feet of gas. Price paid for the recovered liquids ranges from $1.90 to $3 per barrel.

Growth prospects . . . Of the 10.6 trillion cubic feet of natural gas labeled as marketed production by the U.S. Bureau of Mines in 1957, 8.6 trillion cubic feet was processed in gasoline and cycling plants.

Estimates vary as to what per cent of the remaining 2 trillion cubic feet might be subject to economical processing by short-cycle methods.

A majority of the operators feel that eventually much of this unprocessed, marketed gas could be treated by these units economically.

Parkersburg Rig & Reel, which has installed more than 80 of the units now operating, expects to have 18 more going by July 1.

One of the major oil companies, with five units now on stream, plans to install five additional ones before the end of 1959.

Unusual interest in the small plants is reflected in panel discussions and talks which have been presented at recent NGAA and API production meetings. Producers and pipeline companies echo this current interest and are doing their own close scrutiny of where and how these plants might be put to work (OGJ, Feb. 9, p. 91).

They're flexible . . . The units come in a variety of sizes. Parkersburg has 10 stock units, beginning with towers 12 in. in diameter to the largest with towers of 78 in.

All are skid-mounted, can be trucked to the field, and set on concrete bases. The smallest weighs 14,750 lb. and the largest units tip scales near 200,000 lb.

They are preassembled by the manufacturer and can be ready to operate in 3 to 5 days. Most of them are spotted near the well gas source although they can be placed anywhere on the pipeline.

Conversion of smaller units into larger ones is not complicated. A third tower can be added to a two-tower unit at about 30% of the unit's initial cost. In most cases, the three-tower unit will more than double or even treble recovery by shortening the processing time.

A two-tower unit, with towers 24 in. in diameter, would be operated on a 45-min. cycle. Addition of a third tower would cut the cycling time to 15 minutes.

Several conversions of units from two to three-tower operations have been contracted for and will be completed this summer.

If the volume of gas and the pressures decline to the point where recovery of liquids is not feasible, the unit can be moved or it can remain in place and serve simply to dehydrate the gas.

Maintenance . . . Screening and replacement of the silica gel in towers is the No. 1 maintenance item.

One manufacturer recommends screening the desiccant every 12 to 18 months and replacing that part which has become too fine to be effective. Field tests show average replacement at these intervals is 10 to 15% of the desiccant.

In a small two-tower unit, about

TYPICAL SMALL-PLANT PAYOUT

Parkersburg Rig & Reel gives the following typical payout breakdown of a dry desiccant hydrocarbon recovery unit:

Size, M.c.f.	20,000
Cost	$50,772
Liquid recovery, bbl. daily	50.8
Value, per bbl.	$ 2.75
Annual revenue	$50,292
Payout on initial investment	1.01 years

If credit were taken for dehydration of gas, payout time would be further reduced. However, it would be lengthened by including maintenance and operating costs.

650 lb. of desiccant would be used. If 15% of it were replaced, cost would be about $34 at 30 to 35 cents a pound.

There are few additional maintenance problems in cold weather areas.

Outlook . . . These short-cycle units are in their infancy and are being improved and made more efficient, Fred E. Cooper, Houston, chief engineer for Parkersburg, believes.

"They are too new to have all of their operations and their services and even their potentials fall into an infallible pattern," he says.

"Improvements are being studied. Their practical use in the industry in the immediate future in my opinion will dwarf what progress has been made to date."

A major producer urges caution in swinging to the small units. His organization now has several and he says the "free ride as far as dehydration is concerned is good."

"But," he adds, "we need to make a careful study of all three processes in each case and even then, the selection of what tool to use in an in-between processing program is a difficult one. I'm not pessimistic. All I'm urging is that we go slowly in application of this type of thing."

The major value of the small plant is adapting it to use in combination with other types of processing, A. W. Francis, Jr., Tulsa, vice-president for sales of the National Tank Co., feels.

"Adsorption recovery equipment," he says, "supplements in a vital way but does not supplant the low-temperature separation process.

"The wise combined application of these methods can be used to the great good of the producer, on a hydrocarbon recovery basis alone."

Scope limited . . . While the amount of gasolines, propane, butane and pentanes which these units may recover is small compared to total industry recovery through gasoline plants, their operation can be highly effective for the producer.

They perform an on-the-spot service, in distant areas, where gasoline plants of major proportions would not be practical.

If one-half the unprocessed natural gas which is marketed in the U.S. each year might eventually be treated by these mobile units, the gross revenue to producers could approximate $6,500,000.

The units are riding a steady crest of acceptance. They may continue, in their own sphere, to wean away from other processing tools this highly profitable field processing chore.

Jet-Fuel Demand, Costs

• More rigid specifications for hydrocarbon fuels boost the processing costs. Authors predict demand will reach almost 100 million gallons a year.

DEMAND for hydrocarbon fuels to power supersonic aircraft and missiles ultimately will reach 6,500 bbl. daily—almost 100 million gallons a year.

These fuels will be much more costly than present jet fuels, and they will have to meet specifications that demand high thermal stability and narrow boiling range, as well as high heating values and good combustion properties.

The demand prediction and a rundown on the possible processes and costs were made by E. E. Donath and Martin Hess, Koppers Co., in a paper given at the American Institute of Chemical Engineers in Atlantic City.

Minimum heating value of 18,400 B.t.u. per lb. has been established by the Wright Air Development Center. This rules out aromatics because they fall short of this value. Donath and Hess rule out olefins and acetylenes because of their high reactivity and lack of stability.

This leaves paraffins and saturated ring derivatives.

What they are . . . The authors state the lowest-priced thermally stable fuels would be: (1) a mixture of cyclohexane derivatives obtained by alkylation of toluene, xylene, or a mixture of aromatics followed by hydrogenation, or (2) alkylated or hydrogenated creosote oil.

Processes for the conversion of available raw materials are known. Therefore, long-term development work is unnecessary, according to Donath and Hess. Some experimentation would be necessary, however, in order to determine the most efficient designs.

Process possibilities are shown in

Hydrocarbons Still Tops

. . . over exotic fuels for supersonic aircraft, missiles. Oil industry will continue to be the big fuel supplier.

EXOTIC FUELS have been getting the headlines. But hydrocarbons from petroleum still outdo them on a point-by-point comparison.

It seems likely that the oil industry will be called upon to provide the bulk requirements for both rocket engines and air-breathing engines in the future. This includes not only the manned military and commercial aircraft, but long-range missiles and space devices as well.

Potential demands by the military indicate a market for 125 million gallons per year, while commercial supersonic jets could use 150 million gallons a year of high-performance fuels.

These views are held by M. E. Conn and W. G. Dukek of Esso Research & Engineering Co. in a paper presented last week before the SAE National Aeronautical meeting in New York.

Drawbacks . . . Liquid hydrogen, they admitted, clearly ranks as the best fuel for either propulsion system. But the obvious problems of handling a low-density liquid which boils at —423° F. have turned fuels researchers to more suitable hydrogen carriers.

Boranes and other metal hydrides are excellent carriers for hydrogen in terms of density, vapor pressure, and heat content. They have, however, the problem of thermal instability and solid combustion products.

Light metals slurried in a hydrocarbon carrier promise another means of taking advantage of the high heat content of lithium, beryllium, and boron. Even slurried magnesium, the authors said, will demonstrate higher thrust than hydrocarbons alone for short flights. But slurries entail physical problems of great difficulty in handling, cooling of surfaces, and combustion of suspended metals.

Hydrazine is another promising rocket fuel of high energy and reactivity. But its thermal instability and vapor pressure at high temperatures pose serious shortcomings.

Theoretically, Conn and Dukek

Are Rising

the accompanying table. Two to four processing steps would be required, depending on the finished product.

Raw materials, they said, would cost two and a half to five times as much as present jet fuels, and the finished product, 5 to 10 times present jet fuel.

Availability . . . Demand for high-thermal-stability fuels will approach 100 million gallons per year, a comparatively small volume in relation to the consumption of conventional jet fuels, they said.

Required raw materials are monocyclic aromatics, condensed aromatics, gaseous olefins, and hydrogen.

The monocyclic aromatics, benzene, xylene, and toluene, were once a domain of coal and coke ovens. Now they are being produced in increasing amounts by catalytic reforming and extraction from petroleum fractions. Production of these compounds was 642 million gallons in 1957, with 400 million coming from petroleum. And the productive capacity of aromatics from petroleum was nearly double actual petroleum output.

Raw Materials Cost for Tailored Fuels

Compound—	Process steps	Raw materials	Raw material cost per unit of product: Ct./lb.	Ct./gal.
Methyl-isopropyl cyclohexane	2	Toluene, propylene, hydrogen	4.2	28
Diethyl cyclohexane	2	Benzene, ethylene, hydrogen	4.8	32
Propyl bicyclohexyl	3	Benzene, propylene, hydrogen	4.6	34
Bicyclohexyl butane	4	Benzene, ethylene, hydrogen	4.8	35
Ethyl decalin	2	Naphthalene, ethylene, hydrogen	6.3	46
Alkylated, hydrogenated creosote	2	Creosote oil, ethylene, hydrogen	3.2	24

Production of monocyclic aromatics is expected to double by 1975. In addition, large quantities of aromatics not now being extracted from reformate are available if they are needed, Donath and Hess said.

Other aromatics . . . Coke-oven tar is the main commercially available raw material for condensed bicyclic and higher aromatics. In 1956 there were 695 million gallons of available coke-oven tar in the United States.

Donath and Hess said the tar contains, in millions of gallons of each constituent: naphthalene, 85; methyl naphthalene, 20; dimethyl naphthalene, 24; acenaphthene, 11; fluorene, 12; anthracene, 8; phenanthrene, 30; and creosote oil (containing several of the preceding compounds), 126.

This totals about 300 million gallons of recoverable higher aromatics, potentially available for tailored-fuel manufacture.

Since the required olefins and hydrogen can be readily made available, there is a plentiful supply of raw materials for these tailored fuels, the authors concluded.

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note, hydrocarbons appear to be the second best fuel for either rocket or jet engines. But practically, they are the logical fuels to fulfill the special performance needs of high Mach atmospheric vehicles and large liquid rocket boosters.

Which Hydrocarbons? . . . Of the various hydrocarbon classes, the multi-ringed saturated cyclics seem to represent the best compromise on stability, hydrogen-carbon ratio, density, vapor pressure, and low-temperature properties.

Two general types are the condensed ring molecules such as decalin, a hydrogenated naphthalene, and the non-condensed ring structures such as bi-cyclohexyl.

These highly stable types can be prepared from several petroleum sources by various processing routes. Conn and Dukek mentioned complete hydrogenation to eliminate unsaturates, or removal of unsaturates by treating, solvent extraction, or adsorption.

A prolific source of the condensed-ring saturates is cycle stock from cat cracking of gas oil. These aromatics, the authors note, are usually high in sulfur and thus difficult and costly to hydrogenate. They favor treating selected virgin distillates. High-performance fuels can be prepared by concentrating naphthenes. The product quality is about equal to that of hydroaromatics, and manufacturing costs appear to be potentially much lower.

These processed petroleum fractions were rated above the "pure" hydrocarbons on two of three bases: wider availability and lower cost. They fail to measure up on uniformity only. Petroleum fractions will cost one-fourth to one-eighth as much as pure hydrocarbons from coal tar.

Second choice among the hydrocarbons goes to the paraffins. The final choice between naphthenes and paraffins will ultimately depend on full scale engine tests, the authors conclude.

How Authors Rate High-Performance Liquid Fuels

RELATIVE RATING (1 = BEST, 5 = WORST)

	Hydrocarbons	Metal hydrides	Metal slurries	Liquid hydrogen	Hydrazine
Thermal stability	2	4	3	1	4
Heat content	3	2	3	1	5
Specific impulse (LOX)	4	3	5	1	2
Vapor pressure	1	2	2	5	4
Combustion characteristics	3	4	5	1	2
Viscosity-Temperature	1	2	4	5	3
Density	3	4	1	5	2
Specific heat	2	4	2	1	4
Uniformity	4	3	5	1	2
Availability and cost	1	4	2	4	3
Handling	1	3	4	5	2
Over-all rating:					
For air-breathing engine	2	3	4	1	4
For high-thrust rocket engine	2	4	4	1	3

GIANT 36-in. and 30-in. casing is shown ready for use in Texas Eastern's well at Barbers Hill salt dome.

INSPECTING a field-fabricated, 40-in. rea casing is David Cozad, drilling superin

Famous Texas Salt Dome to Become

• Texas Eastern will add flexibility to its products movement with 2-million-barrel cavern at Barbers Hill. Pumping to hit record rate to fill line with propane.

TEXAS Eastern Transmission Co. has started an unusual drilling program that will excavate the world's largest single LPG reservoir and discharge propane faster than any other reservoir pumping system.

Faced with the necessity for filling its Little Big Inch products line rapidly with large propane tenders, Texas Eastern is solving its problem at Barber's Hill salt dome in these two ways:

... It will drill two huge holes 4,000 ft. into the salt dome and leach out caverns. Each, when completed, will have a reservoir capacity of 1 million barrels.

... It will install pumping units large enough to discharge 5,000 bbl. of propane per hour. This means a minimum tender of 50,000 bbl. can be moved into the 20-in. line in 10 hours.

In addition, Texas Eastern will build a 12-in. reversible pipeline from the storage caverns at Mont Belvieu to its Baytown pumping station 10 miles away. Mont Belvieu is 25 miles east of Houston.

The well . . . Last week Texas Eastern's drilling contractor, Lubie Martin Drilling Co., reamed a 40-in. hole to about 160 ft. and set 36-in. surface casing.

This is just step No. 1 in what project engineers believe to be the biggest casing program ever used in a salt-dome reservoir job.

As a safety precaution against loss of product in a cavern that may be used 30 years, the engineers want at least two cemented casings in the salt. That's the reason for the big surface casing.

The drillers plan a 34-in. hole from the surface casing to the caprock, expected at about 500 ft. This will be cased with 30-in. pipe. Next will come casing of 24 and 20 in.

If both of these are cemented in the salt, expected at 1,000 ft., then the operators will drill some 1,500 ft. into the salt for a 13⅜-in. production string and finally another 1,500 ft. for an 8⅝-in. water string.

If the 24-in. casing fails to get the salt, this means inserting another casing size—16 in.—in the program.

Another reason for the large size of the casing is that the 500-ft. caprock is notorious for loss-of-circulation zones.

By late September, Texas Eastern plans to have the well finished and a reservoir of 500,000 bbl. capacity leached and ready for use. Additional leaching gradually will enlarge this to 1 million barrels within 2 to 3 years.

Work on the second well is scheduled to start in about 75 days. It will be located about 400 ft. north of the first one and eventually will have the same capacity.

The two wells will be almost in the center of the big Barbers Hill dome, which is ringed with producing oil wells.

Pumping . . . Texas Eastern will install two 700-hp. centrifugal pumping units for injecting products for storage.

The same units will be used as pipeline boosters to operate in parallel in pumping the product from the wellhead for discharge into the system at Baytown.

In addition, the company will install two 500-hp. centrifugal pumping units to discharge the propane by pumping water into the reservoirs. Two Allis Chalmers pumps on hand at the Baytown station will be installed for the discharge job. The injection pumps have not been purchased.

Texas Eastern will have access to fresh water from a Trinity River canal and will use approximately 50,000 bbl. of water daily during leaching. Eventually injection will hit a rate of 3,500 bbl. per hour.

The operators hope the caprock is sufficiently porous and permeable to take the brine during leaching.

Paul Doran is project engineer for Texas Eastern at the Barbers Hill reservoir, and David Cozad, petroleum engineer, represents Texas Eastern as drilling superintendent.

Where it goes . . . The Little Big

mer used prior to setting 36-in. surface tendent, on the right.

LPG Cavern

Inch is a common carrier, and the new storage at Barbers Hill will be part of this common-carrier system.

The company will be warehousing propane—and perhaps butane later—for anyone who wishes to use the transportation and storage facilities.

The company also is excavating new underground storage at its Todhunter terminal near Cincinnati. The location of storage at both ends of the line will give Texas Eastern greater flexibility in handling products. And it means the Little Big Inch can be used to better advantage during off seasons.

FPC Ruling Is Appealed

A FEDERAL Power Commission order authorizing Panhandle Eastern Pipe Line Co. to discontinue gas sales in the Detroit area has been appealed to federal court.

Petitions for review were filed in the District of Columbia Circuit Court of Appeals by Michigan Consolidated Gas Co. and two other subsidiaries of American Natural Gas System.

The FPC last December authorized Panhandle to abandon deliveries of 127,000,000 cu. ft. of gas per day to Michigan Consolidated. The commission later reaffirmed its decision but postponed the effective date, which originally had been set for March 15. A hearing has been scheduled by the FPC for June 16 to reconsider Panhandle's plan for distribution of the gas.

Gulf Adjusts Prices

. . . of its Texas-Louisiana coastal crudes. Union restores California and Four Corners prices to even higher levels.

OIL MEN could read a sign of price firmness in the assortment of new postings made last week. In rapid succession:

. . . **Gulf cut** postings 7 cents a barrel in Texas and Louisiana coastal areas and Citronelle, Alabama.

. . . **Union Oil** restored cuts in California and Four Corners— in some instances to higher levels than prevailed before the March reduction.

. . . **South Penn Oil** raised prices paid for Pennsylvania Grade crudes by 10 to 17 cents a barrel.

Real adjustments . . . Gulf's cuts are not the start of a new round of price reductions.

Statistics support the company's explanation that the new prices are an adjustment to make the coastal crudes competitive with crudes in other regions which has been cut recently.

The new postings will reduce the price of 40°-gravity Texas Gulf Coast crude from $3.40 to $3.33, South Louisiana Delta (Ostrica) crude from $3.30 to $3.23, other South Louisiana coastal crude from $3.40 to $3.33, and Citronelle from $3.05 to $2.98.

Gulf also changed the differential below 40°-gravity to 3 cents per degree from 2 cents for the Texas and Louisiana crudes. It left the differential unchanged for Citronelle.

Most of the Louisiana and the Citronelle crudes have had only one price cut since the industry-wide increase in January 1957. The Texas crude has remained unchanged during that time. In each instance the oil is still priced from 15 to 23 cents a barrel higher than it was prior to the 1957 increase.

Gulf recently resumed buying its full allowable of Louisiana crude after prorating at 65% for a short period. The company's Port Arthur, Tex., refinery, closed by a strike in February and early March, has resumed operations but is still far from operating at capacity.

Normal operations, however, may be resumed when current turnaround and cleanup projects are completed.

The company after the strike advanced its refinery shutdown schedule and is repairing several units. The plant now is running 150,000 to 200,000 bbl. daily and is slowly increasing the figure toward the normal 275,000 bbl.

The price cuts affect 184,500 bbl. daily—132,000 bbl. in Louisiana, 40,000 bbl. in Texas, and 12,500 bbl. at Citronelle.

Upward trend . . . Union Oil restored more than it cut for some crudes in California and the Four Corners area.

Early in March, Union announced cuts for the two regions amounting to as much as 60 cents a barrel. All these were restored. In addition, Four Corners was boosted by 10 to 13 cents a barrel and California crudes in the middle gravities got an increase of from 1 to 7 cents a barrel.

This made new top of $2.90 a barrel for 40°-gravity Four Corners crude and $3.67 for 40°-gravity Long Beach crude.

Union explained that it cut prices originally because its suppliers refused to cut back their deliveries voluntarily but that subsequently "anticipated changes in petroleum supply and demand" dictated returning prices to previous levels.

Other major buyers in California and the Four Corners area failed to join the Union cut, probably a major factor which influenced Union to change its postings.

Union officials, however, declared they lost no valuable pipeline connections during the price fluctuations.

The Union pricing policy created a furor on the West Coast at the time it was announced.

California producers, already hard hit by earlier price cuts and marketing problems, protested loudly. The Oil Producers Agency of California, composed largely of the independents, sent telegrams of protest to the President, cabinet officials, and other California buyers. Independent refiners, on the other hand, hailed the lower postings as a great boost for them.

The higher Pennsylvania grade prices, meanwhile, were attributed by South Penn Oil Co. to a "continuing draft on stocks resulting from improved demand."

New prices are: Bradford district oil in Bradford Transit Co. $4.15; Bradford district oil in National Transit Co. $4.15; Middle district oil in National Transit Co. $3.97; Pennsylvania Grade oil in National Transit Co. $3.70; Pennsylvania Grade oil in the Eureka Pipe Line Co. $3.57.

The increase was the second for Pennsylvania-Grade oils within recent months. A 15-cent a barrel increase was posted last October on about 30,000 bbl. daily of this production.

Eight Men Chosen to Receive Special

SPECIAL awards honoring eight pioneer oil men for long and outstanding service to the petroleum industry will be presented next month as a highlight of the International Petroleum Exposition.

The eight were chosen last week from nominations received from throughout the oil industry.

William L. Connelly, Tulsa, one of the founders of Sinclair Oil & Refining Corp., was named "Pioneer of Pioneers." The 86-year-old Connelly, who drilled his first well 64 years ago, is one of the best known oil figures in the nation.

Sharing the spotlight at a special awards ceremony May 17 will be seven other "Grand Old Men of the Oil Industry," each representing a major division of the industry.

They are Edmond C. Breene, Oil City, Pa.; William A. Cassidy, Bayonne, N. J.; Edward I. Hanlon, Tulsa; Frank J. Hinderliter, Tulsa; Wiley B. Hissom, Tulsa; Frank H. Lerch, New York; and S. Miller Williams, Robinson, Ill.

Each of the pioneers has played an important role in shaping the oil industry. Selections were made by the Exposition's Old Timers committee headed by W. J. Sherry, Tulsa, who also headed the committee of the 1953 exposition.

Pioneer of Pioneers

William L. Connelly

BILLY CONNELLY

Oil's "Pioneer of Pioneers," who has worked 68 years in the industry, is still active as a special consultant for Sinclair Oil & Gas Co. and vice president of Delaware Consolidated Oil Corp.

Born in Cleveland in 1873, his first venture was taking leases for others in Ohio. His first well in Wood County, Ohio, in 1895 was a producer. He moved west to Kansas in 1903 to drill as a contractor and producer in Montgomery County.

Connelly became associated with Harry F. Sinclair in 1906. At various times during his 53 years with Sinclair, Connelly was president of Mexican Sinclair Oil Corp., Venezuelan Petroleum Corp., and Sinclair Exploration Co., and vice president of Sinclair Cudahy Pipeline Co., Sinclair Refining Co., Mammoth Oil Co., Sinclair Gulf Corp., and Sinclair Consolidated Oil Corp.

At one time he was in charge of all foreign work for Sinclair companies and spent time in Germany, Russia, Venezuela, Panama, and Africa.

After Prairie Oil Co. and the Sinclair companies merged in 1932, Connelly served as chairman of the board of Sinclair Oil & Gas Co. until his resignation in 1950. He was a founder of the Rocky Mountain Oil and Gas Association and the old Mid-Continent Oil Producers Association.

EDMOND C. BREENE

Breene, 81, who was named Grand Old Man of Production, is one of Pennsylvania's most prominent oil men and attorneys. He is now serving as chairman of the board of Winona Oil Co. of Delaware, which he helped found in 1906.

Born near Oil City in 1877, he first worked in the oil industry as a tool dresser in Ohio, West Virginia, and Pennsylvania while studying for his law degree.

Recalling his early days in the eastern and Mid-Continent areas, Breene had a word of praise for "the old-time producer, who was courageous and optimistic, and his word was as good as his bond."

Breene was president of the First National Bank of Oil City for a number of years and a partner in the law firm of Breene & Jobson. He was one of the founders of the Pennsylvania Grade Crude Oil Association and was its first president.

His five sons, James, Edmond, George, Samuel, and Daniel, are all active in the oil industry.

WILEY B. HISSOM

Hissom, who also got an early start in the oil fields of the eastern states, will receive the Grand Old Man of Drilling award.

Born in Millers Run, Ohio, in 1893, as a youth he drove his father's team of horses in the oil fields in the summer and went to school in winter. At 18 he started on a new job carrying water on a pipeline, and later went to Shinniston, W. Va., to work as a roustabout and with a casing crew.

By 1916 he was made driller for South Penn Oil Co. in Folsom, W. Va., and later moved to Oklahoma and Texas. By 1921 he was drilling with his own cable tools in Oklahoma, bought his first rotary rig in 1926.

He was the first ever to redrill a rotary hole (Seminole, Okla., 1928),

Industry Honors at Oil Show in May

Grand Old Men

Edmond C. Breene
Production

Wiley B. Hissom
Drilling

Frank J. Hinderliter
Supplies and Equipment

Edward I. Hanlon
Natural Gasoline

S. Miller Williams
Pipeline and Transportation

Frank H. Lerch
Natural Gas

William A. Cassidy
Refining

and the first to start alternating breaks on tool joints.

Before his retirement he was owner and president of Hissom Drilling Co., now headquartered in Midland, Tex. He serves the company in an advisory capacity.

Several years ago he gave his farm and stock at Sand Springs, Okla., to Oklahoma State University as an experimental farm.

FRANK J. HINDERLITER

Hinderliter, 84, is Grand Old Man of Supplies and Equipment.

Born in Rouseville, Pa., in 1875, he was only 12 years old when he started to work in the oil fields, pumping wells for his father, I. N. Hinderliter, who held two oil-field patents on a tube clamp and a belt coupling.

He worked in a machine shop in St. Marys, W. Va., in 1900, later helped buy the shop, sold out in 1906, and went to work with Oil Well Supply. The company sent him west to Oklahoma in charge of shops.

After World War I he founded the well-known Hinderliter Tool Co. in Tulsa, and was president and general manager when he retired in 1946. He had 99 patents to his credit.

Hinderliter was also one of the organizers of the International Petroleum Exposition in 1923.

EDWARD I. HANLON

Hanlon, 78, will be honored as Grand Old Man of Natural Gasoline. Born in Steubenville, Ohio, he first started to work driving a glycerine wagon in Sistersville, W. Va., where he grew up.

The first of many companies to bear his name was Henaghan & Hanlon, Inc., which was formed at Sistersville early in the century. First production was hauled over the mountains by ox cart to tributaries of the Ohio River.

One of the industry's most coveted awards is named for Hanlon. Each year the Natural Gasoline Association of America presents the Hanlon Award to an individual for outstanding service in the field of natural gasoline.

Hanlon is now serving as chairman of the board of National Bank of Tulsa, chairman of Hanlon-Boyle, Inc., and president of Hanlon Oil Co.

S. MILLER WILLIAMS

Williams, 72, one of the founders of Williams Brothers Co., was named Grand Old Man of Pipeline and Transportation.

Born in Louisville, Ky., in 1887, he and his brother, David R., organized the company in Fort Smith, Ark., in 1908. The first pipeline venture was a 20-mile 8-in. line to Fort Smith.

The company moved to Tulsa and the work spread over the Mid-Continent area and into Canada. Williams Brothers was active in construction of big-inch gas lines in the 1920's. During World War II the company's work was entirely devoted to wartime construction for the Government, including the Big Inch lines, Air Force work in Africa, and Navy projects in the Caribbean area.

Williams retired after the company completed Trans-Arabian pipeline in 1950. He is one of the few honorary members of the Pipeline Contractors Association.

FRANK H. LERCH

Lerch, 71, selected as Grand Old Man of Natural Gas, was chairman of

the board of Consolidated Natural Gas Co. before his retirement in 1953.

Born in Easton, Pa., in 1888, he received a B.S. degree in chemistry in 1909, and later became associated with Ford, Bacon & Davis, Inc., the engineering company which played a big part in planning and building the first long-distance natural-gas pipelines in this country.

He joined Interstate Natural Gas Co., Inc., when it was organized by Standard Oil Co. (N. J.) in 1926. Seven years later he went to New York as assistant and then administrator of Jersey's natural-gas subsidiaries.

Later he was president of Interstate, Mississippi River Fuel Corp. and Colorado Interstate Gas Co. He was named president of Consolidated Natural when Jersey formed that company in 1943.

He was a founder and chairman of the board of the Institute of Gas Technology.

WILLIAM A. CASSIDY

Cassidy, Grand Old Man of Refining, was born in England in 1866, just 7 years after Drake drilled his historic well in Pennsylvania.

The 93-year-old pioneer still lives in Bayonne where he got a job trucking at Standard Oil Trust's refinery in 1882, the year the company was formed. He was superintendent of the plant when he retired in 1926.

Cassidy has served several terms as a member of the city council, traveled in the U. S. and abroad after his retirement, and wrote an autobiography in 1948.

As one of his associates said: "During the long period of his active career, his knowledge of and contribution to the field of lubes and waxes in particular, were unmatched. . . He left an imprint which has lasted through the years."

Trunkline Project Disapproved

. . . by FPC examiner because $81,000,000 expansion would serve only one firm. Full hearing is due April 9.

A FEDERAL Power Commission examiner has turned down an $81,000,000 expansion program proposed by Trunkline Gas Co.

Examiner Francis L. Hall objected because Trunkline sought to increase its gas deliveries to only one company while the needs of other distributors in the area are equally pressing.

He held that the pipeline company was attempting indirectly to allocate its gas supply. This, he said, was a job which Congress had entrusted solely to the FPC.

Also rejected were 13 applications by producers seeking authority to sell gas to Trunkline. Among other things, he ruled, the producers had failed to justify their rates, ranging from 20 to 22 cents per M.c.f.

Oral arguments before the full commission are tentatively set for April 9. The commission previously had adopted a shortcut procedure to permit an early ruling on the examiner's decision. Under the commission's order, companies involved are allowed 7 days, instead of the usual 20, to file exceptions.

The project . . . Trunkline proposed to expand its pipeline system to supply up to 135,000,000 cubic feet of gas per day to Consumers Power Co., Jackson, Mich.

The expansion would involve laying about 895 miles of pipe, including lateral lines in Illinois, Indiana, Louisiana, and Texas. The company also proposed to loop part of its existing system in Texas and between Longville, La., and Tuscola, Ill.

The project would have increased Trunkline's system capacity by about 36%, from 375,000,000 to 500,000,000 cubic feet per day.

Most of the gas was to be obtained from Brazoria and Galveston counties in Texas and from new fields off the coasts of Cameron and Vermilion parishes of Louisiana.

Hall pointed out that the sale to Consumers was to be made under a new rate schedule. If the project is approved, he contended, cost of the expansion should be allocated on a system-wide basis.

This would increase the rates for Trunkline's deliveries to its parent company, Panhandle Eastern Pipe Line Co. Under Trunkline's proposal, Consumers would pay about 45¾ cents per M.c.f. for gas compared to 27 cents now paid by Panhandle.

High prices feared . . . Hall held, though, that every purchaser similarly situated should be eligible for new gas supplies.

He suggested that the record be reopened to permit other customers to show their requirements so they could get their share of expanded capacity.

Approval of the project, Hall feared, would encourage gas producers and pipelines to choose customers who are the highest bidders.

The examiner objected strongly to this "brand of rate making and the high field prices of the producer-applicants." He proposed regulation of field rates from the outset to prevent later price spirals.

PROCESSING BRIEFS . . .

Batzer Oil Corp. is dismantling its refinery at Lovell, Wyo., and selling it to Husky Oil Co., Cody, Wyo. The refinery was closed in late March. Husky plans to use the equipment in its expansion program at Cody. H. O. Batzer said his company will confine its operations to production and marketing of crude oil.

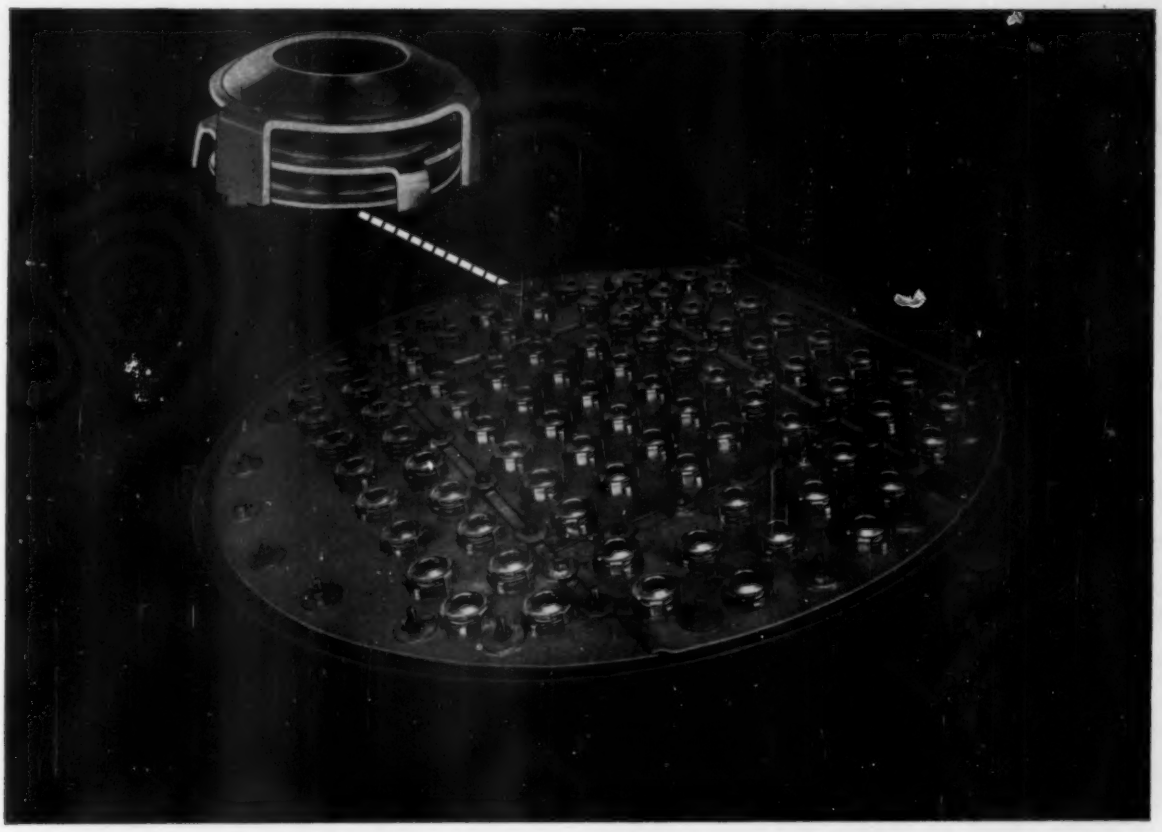
A tentative completion timetable has been set up for several projects at British American's Clarkson, Ont., refinery. These include a middle-distillate desulfurization unit, by April; expansion of the fluid catalytic-cracking unit, by July; and the lubricating oil, compounding and blending plant and the grease plant, by the fourth quarter. A new alkylation unit, now being designed, is scheduled for completion in the spring of 1960.

Operations of two plants at Dawson Creek and Taylor, B.C., formerly operated by Pacific Petroleums, are being taken over by Phillips Petroleum. Both plants, owned 50% each by Phillips and Pacific, are being expanded. The Dawson Creek refinery has capacity of 2,250 bbl. The natural-gas processing plant at Taylor has charging capacity of 3,500 bbl. of natural-gas liquids daily.

Also for Refiners . . .

IN THE NEWS: Import quotas are assigned for residual fuel oil and other finished products (p. 77) . . . Texaco has first computer controlled and operated refining unit (p. 78) . . . Pocket-size gasoline plants which will make money in operations too marginal for conventional units are going great (p. 80) . . . More rigid specs for jet fuels are boosting the processing costs (p. 82).

PLUS THESE TECHNICAL REPORTS: Molex process upgrades gasoline (p. 112) . . . Selective finishing process has reached commercial stage (p. 116) . . . Air cooling saves for Sohio (p. 131).



Something NEW... in Valve Tray Design

OPERATING DATA REVEALS GLITSCH BALLAST TRAYS GIVE GREATER TURNDOWN RATIO — OVER-ALL OPERATING EFFICIENCY

The Glitsch Ballast Tray is a new type valve tray that has all the good features both of conventional bubble cap trays and perforated trays, and yet eliminates the many inherent problems encountered with ordinary valve type trays.

Data secured during operational runs to determine the efficiency of the new Glitsch Ballast Tray established the following: (1) The efficiency of the tray from very low vapor rates (within ten per cent of flood point) up to moderate vapor rates is higher than any other tray of comparable capacity; (2) the turndown ratio of the Glitsch Ballast Tray (the ratio of maximum to minimum vapor rates at which a high efficiency is maintained) is at least 9.0.

The Glitsch ballast unit is designed to function as a variable orifice and thereby provide a staging of the vapor through the various rates of flow. This design permits uniform distribution of vapor through the liquid throughout a wide range of capacity; optimum vapor velocity through the liquid over a wide range of flow rates; large turndown ratio by progressive staging of the vapor opening from low to increasingly high fluid rates, and establishes a primary pressure drop at the vapor-liquid interface to obtain maximum tray efficiency.

Increase the efficiency of your next distillation units. Specify new Glitsch Ballast Trays. For more information and operating data on the ballast tray, contact your nearest Glitsch sales representative or Glitsch – Dallas, Texas.

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Internal Pipe Coating Boosts Gas Flow

- **Early Transco tests show coating may increase capacity as much as 5%.**

INTERNAL coating of natural-gas lines apparently results in a significant increase in transmission capacity.

The increase may be on the order of 5%.

The industry has speculated for some years on the possible efficiency gain to be obtained through internal coating. Now, for the first time, enough information is available to support theories of increased efficiency.

A good epoxy coating has been shown to reduce pipe-wall roughness, and thereby improve efficiency, of even "smooth" new pipe. The improvement is much greater for pipe which has rusted in storage for several months before being laid.

INTERNAL COATING can be applied either in the yard or after the pipe is laid. Transco has limited its coating to the yard (above). Some coating on each side of the weld is destroyed when the pipe is laid, but the yard coating is an easier operation than in-place coating.

Transco shows the way . . . Transcontinental Gas Pipe Line Corp. has pioneered in this field.

It has coated more than a thousand miles of large-diameter pipe in the past 4 years. A widely awaited report disclosing these results for the first time is published elsewhere in this issue (see p. 107).

Raymond H. Crowe, chief engineer for Transco, says if the work of others corroborates, then internal coating may become standard practice in gas-line construction.

It's understood that efficiency increases indicated in Transco's experience are supported by another recent study whose results will be published shortly. Several companies participated in flow-efficiency tests on a 12-mile 26-in. section of line near Houston. The line was tested bare and also after being internally coated.

This study will be another major contribution to knowledge of the effect of internal coating on flow efficiency. It will be of special significance because the tests were conducted under carefully controlled conditions to eliminate past trouble in ascertaining results.

These studies will greatly stimulate internal coating, which up to now has been very limited because of lack of engineering data as to its effect.

Capital savings . . . The following hypothetical case shows the potential capital savings from internal coating.

A 1,500-mile 36-in. gas line which has been proposed would cost $340,000,000. Capacity would be 680,000,000 cu. ft. per day.

This system could be internally coated for $2,851,200. Assuming a 5% efficiency gain, the coating investment would provide 34,000,000 cu. ft. daily of added capacity. This compares with an investment of $1,000,000 per 2,000,000 cu. ft. of capacity in the original system.

Other benefits . . . Besides the indicated capacity gain, internal coating offers these other advantages:

. . . Reduced pigging cost—scraper runs do not need to be made as often, and the cost of each run is less because of lower pressures required.

. . . Reduced contamination — prevention of internal corrosion cuts out iron oxide, the major source of pipeline dust which is damaging to valves, fittings, and orifice meters.

. . . Efficiency is maintained at original levels instead of declining in service.

Coating of gas lines . . . The practice of coating the interior of a gas line has been limited to a few companies and is of very recent origin.

Manufacturer's Light & Heat Co. coated 40 miles of 16 to 26-in. line about 4 years ago. Permian Basin Pipeline Co. last week completed internally coating a 65-mile, 16-in. line.

Transco has coated its pipe at a yard or mill before laying. The recent cooperative industry test was made on a line coated in place. The Permian line, also coated in place, is the longest single project on which this method has been used.

When the line is coated before laying, the coating is destroyed or damaged for 1 to 2 in. on either side of the weld. The effect of this damage on corrosion or flow is not known. The in-place method provides an unbroken coating but is more difficult to apply.

In the early stages of internal-coating, problems with cleaning and the coating material hampered effectiveness. Surface-preparation technique has been much improved, and new epoxy materials seem to be performing well.

Coating of oil lines . . . During the past 10 years, sour-crude gathering lines in the Permian basin of West Texas and New Mexico have been protected extensively by internal coating.

It has also been used to combat paraffin deposition in crude flow lines and to prevent corrosion, contamination, and maintain efficiency of water lines. Internal coating has been considered for products lines to prevent corrosion and product contamination.

What are the prospects for capacity

gains on oil lines similar to those experienced on gas lines? The answer awaits further study. But outstanding pipeline hydraulics students have privately expressed doubt of any significant increase. Previous studies show that the roughness factor is of less consequence on oil flow than on gas flow.

Pipeline Company Formed

SEVERAL well-known oil men have organized a crude-gathering company in Sherveport, La.

The company, Wilcox Crude Oil Corp., was organized by George T. Naff, former president of Texas Eastern Transmission Corp.; A. Dale Greene, pipeline consultant and former director and executive vice president of United Gas Pipeline Co.; and Charles T. McCord, Jr., owner of McCord Oil Co.

Officers of the company include McCord, president; Naff, Greene, and Harold K. Ross of Ross Producing Co., vice presidents; and Austin Robinson, secretary-treasurer of Crow Drilling & Producing Co., assistant treasurer.

Wilcox has started construction on its first facility, a $500,000, 20-mile pipeline in east central Louisiana between Harrisonburg and Ross Bayou. Wilcox will purchase crude at the well sites in the Harrisonburg area, transmit it, and sell it at its terminal to Esso Crude Oil Purchasing Co.

Rate War Blocks Pipe Funds

SALE OF SECURITIES to finance $84-million in pipeline construction cannot be arranged until its rate controversy with the city of Denver is settled, Colorado Interstate Gas Co. says.

Denver has refused a $6.6 million refund and a 15.6% gas rate reduction offered by CIG. The rate reduction would save gas consumers $5.7 million a year. The $6.6 million represents overcharges from February 5, 1958, to date of settlement.

Denver claims the reduction is insufficient and is based on 1957 instead of 1958 earnings and sales. The Colorado Public Utilities Commission has urged that CIG, Denver, and Public Service Co. of Colorado meet in Washington with Federal Power Commission representatives to attempt a compromise. Colorado Interstate has agreed to the Washington meeting.

CIG says $35 million of the pipeline construction fund would be used for lines expanding service to Colorado customers.

watching WASHINGTON

Joe Reilly

• Fight looms on foreign tax credit

POLITICAL REACTION TO THE NEW IMPORT CONTROLS may bring a Senate fight for higher taxes on U.S. oil companies with foreign production.

Senators from some of the major producing states have ganged up in defense of the administration's import program. They have succeeded in blunting the attack by consumer-state congressmen. In doing so, they have invited further attacks on the depletion allowance and foreign-tax credits.

The imports counterattack was led by Sen. Russell B. Long (D-La.). Joining him were half a dozen other senators from oil states.

In one of his rare major speeches in the Senate, Long defended the industry against "corrupting power" charges by Sen. William Proxmire (D-Wis.). "If the junior Senator from Wisconsin knows of unexposed corruption in Government," said Long, "it is certainly his duty to bring forth his evidence."

Long answered critics who claim the new import program discriminates against Canada. Importing companies in the Pacific Northwest had not been filling their allocations under the voluntary program with Canadian oil, he said. This was "not because of any U. S. Government restrictions, but because these importers found a cheaper source of supply . . ."

He stressed the fact that about 45% of Canadian demand is being supplied by Middle East and Venezuelan oil.

THE LOUISIANA SENATOR defended the imports cutback, not only on defense grounds but on business grounds as well.

"I have not been able to find a single instance, with the exception of the United States of America," he stated, "in which a country has permitted one of its major industries to lose its domestic market, or even a significant portion of its domestic market."

The tax advantage enjoyed by U.S. oil companies with foreign production has encouraged imports to crowd out domestic oil, Long contended. This tax advantage, he said, "makes the percentage depletion allowance appear very small by comparison."

A bill to abolish the depletion allowance on foreign production has been threatened by Sen. Joseph C. O'Mahoney (D-Wyo.). O'Mahoney was among the senators joining in Long's defense of import quotas.

But Long contends that a depletion cut would not bring the U. S. Government any additional revenue from foreign-oil income. Companies are allowed a U.S. tax credit for taxes paid to a foreign government. Thus, a depletion cut would permit foreign producing nations to increase their taxes on U.S. oil companies "to claim for their treasuries that which would otherwise escape their taxation to the benefit of Uncle Sam.

A SECRET REPORT ON ARABIAN AMERICAN OIL Co.'s operations in Saudi Arabia is now before the Senate finance committee, of which Long is a member.

Long noted that some committee members "have been very much troubled" about the Saudi Arabia situation. And, he said, the Treasury "is concerned about the fact that here are companies making more than a billion dollars in profit a year on which they are paying virtually no taxes."

Long confessed suspicions that "the ruler of Saudi Arabia was demanding more money from the oil companies and that some of them simply pointed out that if he ceased to call these large royalties by their name and instead, called them taxes, they would have tremendous tax savings from the United States Government which they would be happy to remit to the Government of Saudi Arabia."

"That is probably what actually happened," Long told his Senate colleagues, "although the report does not quite say so."

Radioactive tracers pinpoint fuel and additive distribution

Engine equipped to measure fuel distribution and collect exhaust gas condensates from individual cylinders.

Ethyl Research shows how diet of each engine cylinder can be accurately determined

VARIATIONS in the fuel-air mixture ratio from cylinder to cylinder in a gasoline engine affect fuel economy, engine performance, and octane requirement.

This maldistribution also changes the composition of the fuel and the amount of additives received by each cylinder.

For example, one cylinder may receive a mixture with higher antiknock quality than it needs for maximum performance. At the same time another cylinder may raise the octane requirement of the whole engine by not receiving fuel of sufficient antiknock quality.

Fuel injection represents one solution to this problem. Ethyl Research now points the way to other solutions via modification of the present carburetor and tailoring of the fuel and additives.

Until recently it has been difficult to measure the portions of the fuel reaching each individual cylinder. Now accurate determinations can be made, not only of the whole fuel distribution, but also of individual components including additives.

Radioactive Tracer Techniques Provide the Key

Starting with deuterium (hydrogen-2), then carbon-14, and finally tritium (hydrogen-3), Ethyl Research tags hydrocarbon fragments of fuel and additives. Tagged components are blended into a commercial-type fuel, and their distribution is determined by measuring the radioactivity of the exhaust-gas condensate from each cylinder.

The quantity of fuel distributed to the cylinders is measured by an exhaust-gas analyzer of the catalytic-cell type.

Exhaust gas sampling is accomplished by means of an electrically controlled valve equipped with spark plug electrodes. The valve is installed in the regular spark plug hole and functions both as a high-speed (1/1,000 second) sampler and ignition source.

An electrical control system tells the valve precisely when to open during a given engine cycle.

Helpful to Both Oil and Automotive Industries

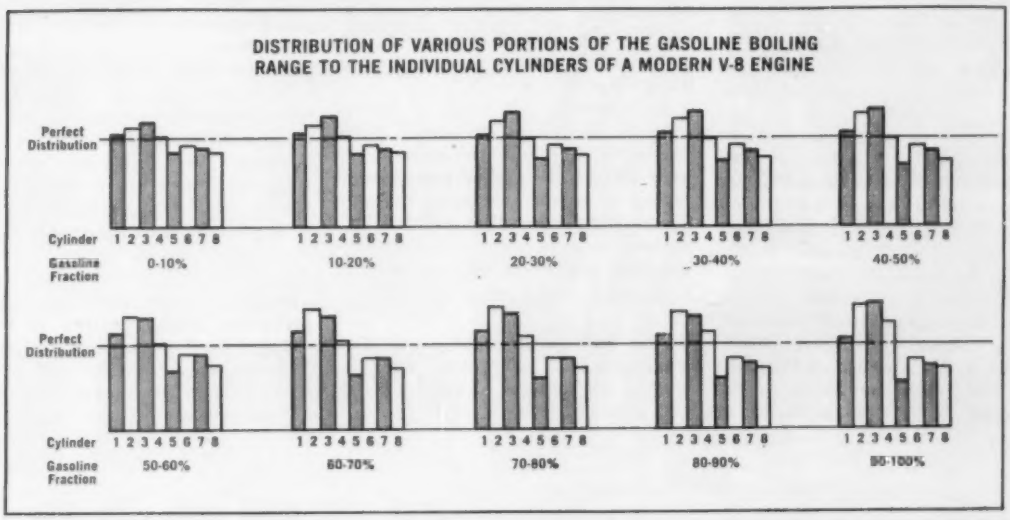
Studies such as this on the subject of fuel distribution to engine cylinders yield data which can be used by both the Petroleum and Automotive Industries in planning future fuels and engines.

A complete description of Ethyl's research on the fuel distribution problem was presented to the Society of Automotive Engineers at their National Winter Meeting in Detroit in January.

Major conclusions of this work are:

1. Uniform fuel distribution can be approached by modification of present carburetor and manifold design.

2. Antiknock quality effects brought about by poor distribution can be reduced by improved formulation of the gasoline blend.



How Ethyl Research is helping you

By exploring all facets of the fuel-engine relationship, Ethyl Research helps protect the refiner against any possible incompatibility of his fuels in the engines in which they will be used.

Ethyl Research findings are continuously made available to the refiner in technical reports, publications, and personal presentations by Ethyl Research Representatives.

Specific information about the fuel distribution problem is contained in the SAE paper entitled "Radioactive Tracers Cast New Light on Fuel Distribution." Your Ethyl Representative will be glad to see that you receive a copy upon request.

ETHYL CORPORATION
NEW YORK 17, N. Y.

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RESEARCH LABORATORIES:
1600 W. Eight Mile Road, Ferndale 20, Mich.
2600 Cajon Road, San Bernardino, Calif.

Gas Processing Still Advancing

. . . gas-conditioning conference told. Townsend process, molecular sieves show promise in future gas treating.

NEW and promising processes are being developed for treating of natural gas.

One process of promise is the SO_2-glycol ("Townsend") process that in one step directly oxidizes the H_2S to elemental sulfur while it dehydrates. This is now in pilot plant testing to resolve corrosion and other problems.

Another approach is through the use of newer adsorbents, the molecular sieves. While not yet fully conclusive, indications are that selective adsorption of H_2S can be effected on an industrial basis.

Processes now in use are the iron sponge, amine, hot potassium carbonate, and glycol-amine.

Fred Zapffe of Lone Star Gas Co. says there is no "best" process, only the best for a given economic situation.

Molecular sieves . . . It may be possible to use the 4A molecular sieves for large-scale natural-gas dehydration in existing installations, making only minor piping modifications, E. L. Clark, of the Linde Co., says.

Developments are continuing, he says, on the application of molecular sieves as trimmer beds (OGJ, March 17, 1958, p. 83) and in both slow and rapid drying cycle equipment. At its Tonawanda, N. Y., laboratories, Linde has been studying one basic equipment approach involving use of internal heating coils.

Manufacturers are making other approaches in equipment designed to use molecular sieves and may be expected to have 1959 prototypes that can be used at the wellhead or for streams too small to be handled ordinarily by glycol-amine units.

Hot potassium carbonate . . . This is a newcomer and is still to be proven in corrosion rates, long-range chemicals consumption, and other aspects.

Acid gas cannot be completely removed from a natural-gas stream with this process. Therefore, it serves its best function in combination with an amine plant downstream to remove the residual acid gas.

Its economic advantage is that it reduces the size of the amine plant that would be required if amine alone were used, and at some considerable savings in comparable potassium carbonate extraction. The potash plant requires no heat exchangers and considerably less steam stripping than a comparable amine plant.

Amine and glycol-amine . . . The amine process, Zapffe says, is a proven method for removal of essentially all H_2S as well as CO_2.

Most economical maintenance is obtained by using the lowest possible concentration of amine in solution, about 12-15 maximum weight %, and a circulation rate such that each gallon of solution picks up no more than a nominal amount of acid gas.

One advantage of the amine process is that it will produce essentially H_2S-free sendout gas above an operating pressure of about 100 psig. Too, it is a continuous regenerative system. Disadvantages are that it will not deliver completely sweet gas at pressures somewhat below 100 psig. contactor pressure, and that it removes CO_2 when possibly it might be an advantage to retain the CO_2.

The glycol-amine process has a place where partial dehydration of the gas is acceptable and modern water content contracts are not required.

Iron sponge . . . This has been in use for many years by the manufactured gas industry and has found a belated place in the natural-gas picture.

It is advantageous in that it provides complete removal of small to medium concentrations of H_2S without removing CO_2, requires relatively small investment, and is equally effective at any operating pressure.

The disadvantages are that it is a batch process and requires duplicate installation or interruption in gas processing, it is very prone to hydrate formation when operated at higher pressure and at temperatures in the hydrate range, and it will remove ethyl mercaptan that has been added for odorization.

the JOURNAL *said . . . . . .*

50 years ago

April 6, 1909

Leading oil men from many parts of the country flock to Madill, near the Red River, in Marshall County, southern Oklahoma, following reports of a large, shallow-sand (500 ft.), flowing high-gravity oil well at the edge of town. Many regard the well as a freak but the general topography around Madill is considered favorable for oil development.

Fire destroys the old Sour Lake Springs hotel, landmark and famous hostelry in the early oil-boom days of the Sour Lake field, on the Texas Gulf Coast. The hotel was owned and operated by The Texas Co., which acquired it in 1903 with the purchase of oil property adjoining and on which the hotel was located.

Gulf Coast oil production drops to its lowest ebb in history of the area. Daily output of Texas coastal fields is down to 24,900 bbl. That of Louisiana's coast is 8,800 bbl. A sharp falling off in the output of Louisiana's Jennings field is blamed for much of the shrinkage. Prospects for improvement are not rosy.

25 years ago

April 5, 1934

A state-wide emergency oil conference at Dallas gives the Railroad Commission 2 weeks to stop hot-oil production in the East Texas field before asking federal control. Col. E. O. Thompson, commissioner, defended the commission's record.

Michigan's oldest active drilling project climaxes 9 years of hard luck. Newaygo Prospecting Co. 1 Ichemberg, in 7-16n-11w, Newaygo Township and county, drilled into salt water after a show of oil in the Dundee formation. Total depth 3,450 ft. with oil and gas shows at 3,368.

J. Paul Getty, prominent California operator and holder of a substantial stock interest in Tide Water Associated Oil Co., purchases a 170-ft. diesel yacht.

Morocco's first important oil well blows in with a column of oil shooting 300 ft. high and catching fire. It was drilled by Soc. Cherifienne des Petroles on Djebel Tselfat mountain between Petitjean and Fez. Flow is estimated at 250 tons (1,750 bbl.) daily from depth of 1,250 ft.

10 years ago

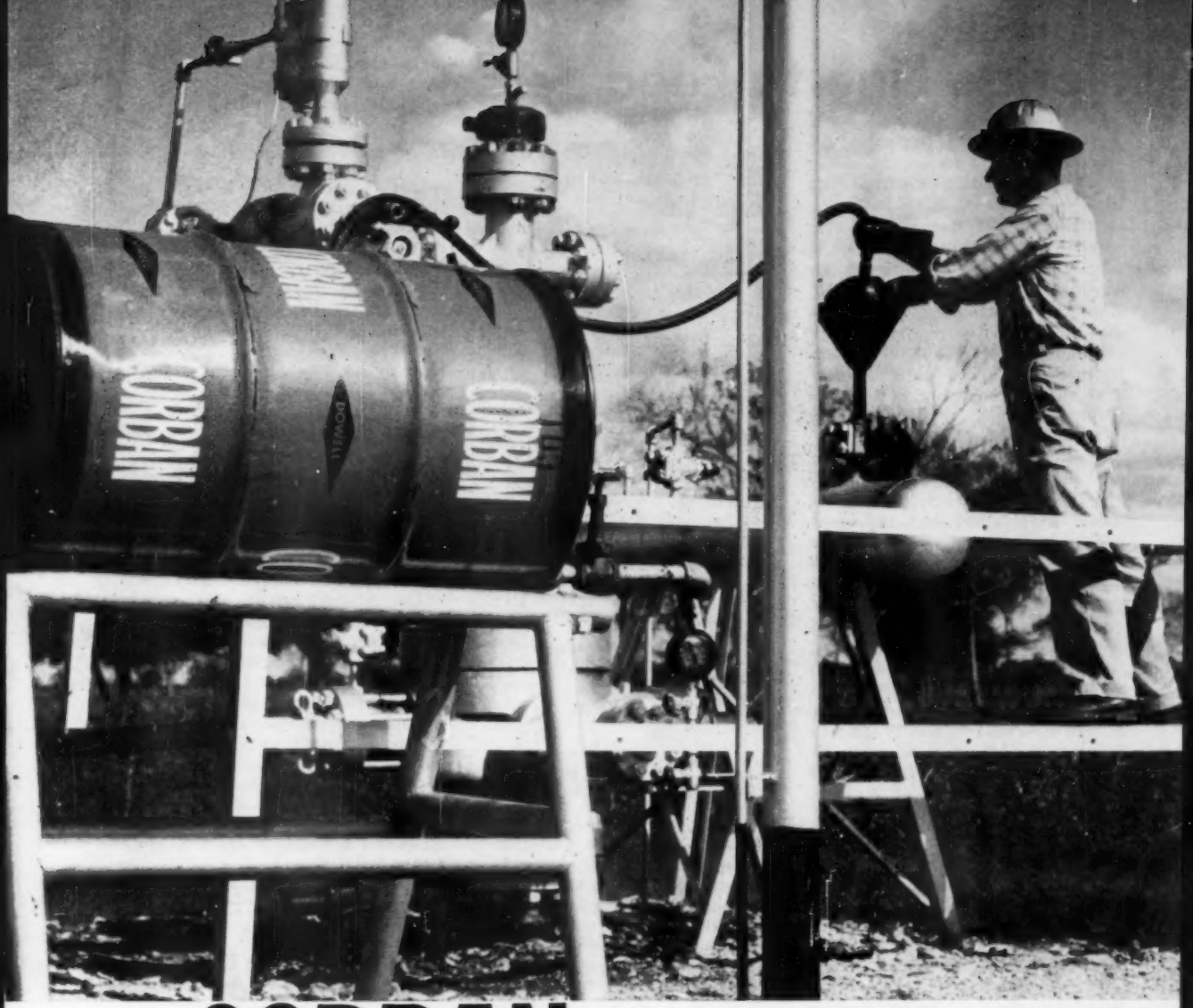
April 7, 1949

Sinclair Oil Corp. has all equipment on location for the first test well on its Ethiopian concession. Site is 475 miles southeast of Diredawa in the Ogadan district. Walter Wells, veteran Sinclair superintendent, is in charge. Under its concession, Sinclair has exclusive rights in the entire country for 5 years.

Universal Oil Products Co. introduces "platforming" as a new process for improving straightrun or natural gasoline.

F. W. Little, superintendent of communications and transportation for Shell Pipe Line Co., predicts radio communication will be adopted on pipeline systems within the next 5 years.

A new rank-wildcat limestone reef oil strike by Seaboard Oil Co. of Delaware and Pan American Petroleum Corp. in southwestern Borden County, West Central Texas, adds fuel to the fire of interest in what appears to be widespread oil possibilities on the east side of the Midland Black Shale basin.



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Florida Line to Feed Jets

- **Everglades project has unique management setup with Buckeye.**

A PIONEERING step is being taken by Everglades Pipe Line Co. in starting the 34-mile, 10-in. common carrier products pipeline in Florida from Port Everglades to the Miami International Airport. Though the line is short, it is important as an early venture in major airport pipelining to serve the jet age.

Buckeye Pipe Line Co.'s assumption of top position in Everglades management is probably the first instance when a nonproducing, nonrefining, and nonmarketing company has headed up a group of major integrated oil companies joining together in the ownership of a pipeline.

Buckeye, which acts as agent for the other companies and will be the operator of Everglades, is the largest independent petroleum pipeline company in the country. Furthermore, Everglades is the first project in which Buckeye has been associated with other companies. Ownership of Everglades is divided as follows: Buckeye, 41%; Cities Service, 39%; Pure Oil, 10%; and Phillips Petroleum, 10%.

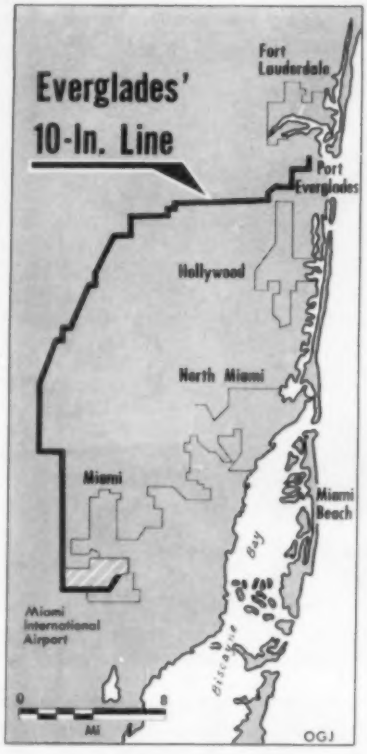
Buckeye's position in Everglades may be a forerunner of future groupings of major-company pipeline ownerships under the leadership of strictly pipeline-operating firms in which the industry has confidence.

Pipeline facilities . . . The $2,750,000 pipeline is now being laid under contract with Latex Construction Co. of Georgia.

Pipe is seamless with ¼-in. wall thickness except ⅜-in. used in the first mile near Port Everglades to conform to port regulations and ½-in. used for negative buoyancy in major drainage canal crossings.

The line passes through typical Florida Everglades swamp country where the water table is high and crosses many major and minor drainage canals. Pipe is protected by coal-tar enamel, glass mat, and felt. Cathodic protection will be furnished by one or two small rectifier units to be determined from survey data after the line is finished.

The one and only station on the line is to be built on land owned by the company adjacent to the Port Everglades terminal. This is between Fort Lauderdale and Hollywood.



Mainline pumps are two 2-stage centrifugal pumps, each driven by a 300-hp. electric motor. The two units are duplicates. One would be a standby initially. The units are designed to be used in series, without impelled change, for second phase increased capacity.

Throughput . . . The initial pumping rate of each unit would be about 1,500 bbl. per hour with capacity of 2,100 bbl. per hour in series. Ultimately pumps could be changed to increase capacity to 2,800-2,900 bbl. per hour.

For boosting to mainline-station suction there are two 60-hp. vertical pumps. All switch-gear pumps and meters are outdoors. The office and control room is in a small building.

Most operations will be manual initially with provision for future automatic operation.

Products will be metered in and out of the line with conventional positive-displacement meters.

Sixty days will be taken for building the station and metering facilities, and 75 days for laying the pipeline.

The line is a common carrier planned for delivering products from the 14 or 15 oil companies having tankage and terminal facilities at Port Everglades to aboveground tanks of individual airlines operating from the Miami airport. There are about 40 airlines using the airport for domestic and foreign service.

One of the airlines, Eastern Air Lines, has invested $1,250,000 in an underground fueling system at the airport. An 18-in. line and two 14-in. lines from storage tanks a mile from the terminal enable Eastern to fuel 22 planes simultaneously (OGJ, Sept. 8, 1958, p. 81).

Seaport and airport . . . Most shipments will come to Port Everglades by tanker from the Port Arthur-Beaumont area, Lake Charles, and Baton Rouge.

All shipments will be received by the pipeline from the existing storage facilities of the oil company shippers.

The Everglades pipeline tariff will be competitive with the present trucking cost of 12 cents per barrel.

The Miami airport—the second largest in the country—uses about 7,500 bbl. of avgas and jet fuel per day. Now there are only two lines using jets. By 1961, 50% of the flights out of Miami will use jet or turboprop equipment. In 1961 fuel requirements will triple to over 20,000 bbl. per day.

Construction activities are under the supervision of Donald R. Merriman, vice president of Everglades. Oscar C. Nonweiler is manager who will have charge of operating the line.

PIPELINE

A 38-mile, 24-in. line will be built by Consumers Power Corp. from Woodbury station to Laingsburg Junction, Mich. Williams Brothers, Tulsa, has received the contract for the gas line. The project will be completed by July 15.

A 72-mile, 12-in. gas line being built for Bi-Stone Fuel is nearing completion. Clay P. Carey Co., Brownwood, Tex., expects to complete the line from Reed field to Lake Creek, Tex., next week.

Contract to lay a 63-mile, 20-in. line in Pennsylvania has been awarded to Harford Brothers, Emporium, Pa. The line will be laid for Manufacturer's Light & Heat, replacing 135 miles of 6-in. Completion is scheduled in the fall.

A $6-million project to increase gas deliveries from West Virginia storage

Octane Rise Hits Fast Clip

. . . in first quarter compared with last year. West Coast has come from last place to first in the octane race.

THE OCTANE race apparently is on in full swing again.

Ethyl Corp.'s monthly survey of gasoline quality shows the national average for both premium and regular was up a tenth of a number in March.

Average premium moved up to 99.1 (Research) and regular to 91.7. This made a gain of 0.3 for premium and 0.2 for regular in the first quarter of 1959. In the same period of last year, premium gained only 0.1 and regular none at all.

During 1958 the average quality of both premium and regular increased 0.4 of number, the smallest gain in years. Thus the jump in the first quarter of this year alone was three quarters as much as 1958 for premium and half as much for regular.

One result has been to make 100-octane premium almost commonplace. According to Ethyl's March report, it is now available from one or more suppliers in 27 of the 57 cities included in the survey. Seattle led all the rest with a city-wide average of exactly 100 octane for eight samples. Four of the eight samples picked up in Seattle ranged from 100.3 to 100.6.

There were 17 different brands of 100-octane premium on sale throughout the country in March. Most showed up in the survey in only one or two cities, but several are widely distributed.

West Coast . . . Greatest concentration of 100-octane premium brands is on the Pacific Coast.

There, six suppliers are handling motor fuel of this quality. Three of the six were found throughout the area while the other three were sampled in one city only.

This is a complete turnabout in the West Coast's historic octane position. In one year's time it has progressed from the area with the lowest effective top octanes, to the highest.

This trend began just a year ago when Tidewater Oil Co. jumped premium in the three coastal states to 100-plus Research octane. No one matched this rating throughout the summer. By October, however, three other companies were marketing 100-octane premium and an additional two have joined the parade since.

TEL concentration in the 100-octane premiums varies widely. The most widely distributed brand uses close to the maximum of 3 cc. in its West Coast gasoline, but only 1.5 cc. in that distributed in the East. The lone 100-octane premium picked up in Little Rock, Ark., was unleaded.

Gasoline of 99 octane or better is now available nation wide except for the Rocky Mountain area. The premium average for Denver, for example, was only 95.9, with one brand as low as 92.2. This apparent deficiency is compensated for, of course, by the altitude, which boosts effective octanes.

Best quality regular is to be found in northeastern cities. All cities in this area had regular-grade averages of 93-plus. The survey also reported on 43 samples of superpremium brands. Eleven were 102 octane or higher, with the top at 102.7 octane.

El Paso May Gasify Coal

THE INTERIOR Department has granted El Paso Natural Gas Co. a permit to prospect for coal on 85,760 acres in the New Mexico portion of the Navajo Indian Reservation for possible use in the production of gas or liquid hydrocarbons.

During the next 18 months El Paso may select 34,560 acres which it will have an option to lease.

El Paso intends to process the coal for gas to be mixed with natural gas which the company pipes to California, or to make liquid-hydrocarbon components of motor fuels, with tar and chemicals as byproducts.

If sufficient reserves are available, El Paso plans to spend at least $1 million on development and construction of a pilot plant.

BRIEFS . . .

to the Pittsburgh area will be started this year by Equitable Gas Co. The expansion will include 42.5 miles of 16-in. and 26 miles of 20-in. between Lumberport, W. Va., and Hartson, Pa. The final segment will be completed in 1962 when the Rhodes storage pool will be in full service. The line will have capacity of 46,000,000 cu. ft. per day.

Transcontinental Gas Pipe Line's plans for a $68,966,000 expansion are to be heard by the FPC May 18. The proposed project includes 288 miles of loops and installation of 61,380 hp. in two new and 11 existing compressor stations. New facilities would increase Transco's capacity by 145,580,000 cu. ft. per day. The increase would include an additional 9,000,000 cu. ft. of gas per day to be transported for Sun Oil Co. for use in a new chemical plant near Marcus Hook, Pa.

Gas service to Acme, Beiseker, Irricana, Carbon and Strathmore in southern Alberta, Canada, will be provided this year in a $5,700,000 expansion program by Canadian Western Natural Gas Co. Connections will be made with the Calgary-Carbon line completed in 1958. The company also is considering connections with the Alberta Gas Trunk Line to serve Barons, Carmangay, and Champion.

A $1,486,020 expansion is planned by Kansas-Nebraska Natural Gas. Its FPC application lists a 15.5-mile 12-in. loop, 1,000 hp. at Holcomb compressor station, 2,000 hp. at Scott City, and 1,800 hp. at the new Quinter, Kans., station. Kansas-Nebraska will boost deliveries from the Hugoton area to western Kansas and central and northern Nebraska.

A contract for two short loop lines for Northern Natural Gas has been awarded to R. H. Fulton & Co. The loops are 11 miles of 30-in. north of Sunray, Tex., and 8 miles of 30-in. north of Beaver, Okla.

The 1959 Appalachian Underground Corrosion Short Course is scheduled for June 2-4 at West Virginia University, the sponsor, at Morgantown, W. Va. The course includes several lectures on problems of underground corrosion and field demonstrations.

Also for Pipeliners . . .

IN THE NEWS: Tests show internal pipe coating materially boosts capacity of gas-transmission lines (p. 90) . . . Everglades products line in Florida marks pioneer venture in jet-age pipelining for a major airport (p. 96) . . . Pan American attacks Texas Railroad Commission's latest ratable-take order for gas (p. 98) . . . Sun is building new pipeline in Lake Maracaibo (p. 103).

A complete list of pipeline projects is carried in the last issue of the month. Current projects are carried in Pipeline Briefs.

Imports Study Lags

• Only one bill has come out of special study made by governor's commission.

THE TEXAS LEGISLATURE so far has done little to carry out a program recommended by Gov. Price Daniel's oil-import-study commission to lessen import effects on the state economy.

It has, for that mattter, done little toward advancing any of several other bills having to do with imports.

The only bill which now appears to have a reasonable chance of becoming law is Senate Bill 216 introduced by Sen. Grady Hazelwood to tighten the Texas statutes dealing with common purchasers and ratable take.

This bill has been thoroughly rewritten by a subcommittee of the Senate oil and gas committee after a move to send it to the Senate floor was beaten down.

The rewritten version is expected to be much more palatable to common purchasers and carriers of crude oil. The portions of the bill which would have imposed new regulations on pipelines and trucking systems were removed.

Prime contribution of the rewritten bill is that it more clearly fixes responsibility for ratable crude buying. The revised Hazelwood bill reportedly was to be considered by the oil and gas committee late last week.

Other bills buried . . . Other bills, with oil imports as targets, are buried in various subcommittees, and, unlike the Hazelwood bill, are likely to stay there.

They include:

. . . SB 657, which would make it illegal to sell fuels refined from crude oil unless the seller posted a sign that the refiner does or does not import crude into the U.S.

. . . HB 203, which would authorize the Railroad Commission to consider the amount of crude oil imported into Texas in its determination of market demand.

. . . HB 314, which would prohibit oil companies engaged in purchasing or transporting oil from favoring their own production or that of affiliated firms. It also would bar sale or other disposal of crude gathering systems to avoid operation of Texas conservation laws.

Load limit raised . . . Meanwhile, the Senate passed a bill raising the state maximum load limit for trucks to 72,000 lb. from the current 58,420 lb.

The House version of the same bill came up for hearing before the House motor-traffic committee last week. Committee and House approval are expected.

Gas Order Is Hit

as Pan Am seeks reversal in Texas ratable-take case.

PAN AMERICAN Petroleum Corp. has filed suit in district court in Austin, Tex., attacking the Texas Railroad Commission's most recent ratable-take order for gas.

Pan American seeks to reverse a commission order directing that West Texas Gathering Co., the pipeline gas buyer in Emperor field of West Texas, take gas from the field according to the field allocation formula.

The commission so ruled (OGJ, Mar. 9, p. 90) following a hearing on a complaint by W. A. Moncrief, Jr., Fort Worth operator, that West Texas Gathering declined to buy gas ratably from his well in Emperor field.

The pipeline, he said, offered only a contract based 100% on acreage whereas the allocation formula for the field is based two-thirds on acreage, one-third on the well. Moncrief's lone Emperor well is completed on a 5-acre tract under a spacing exception.

Pan American and other operators in the field contend that the order sought by Moncrief and approved by the commission would permit the Fort Worth operator to sell more than his fair share of gas and drain offsetting properties.

The commission ruled these arguments irrelevant since the allocation formula for the field was set at a previous hearing and was not at issue in the ratable-take hearing.

Alberta Bids Down

for April. Turnaround, high stocks, controls are blamed.

NOMINATIONS for Alberta crude in April totaled 308,459 bbl. daily, a drop of 43,410 bbl. daily below the March figure, and more than 100,000 bbl. less than the February total.

Blamed for the lower requirements are refinery turnarounds, unusually high gasoline inventories, and the recently announced mandatory import-control program in the U. S.

The biggest drop will come in Ontario where deliveries will be trimmed to 99,465 bbl. from the 125,070 bbl. taken in March. Alberta's requirements, totaling 60,667 bbl., are down 4,313 bbl. Saskatchewan plants nominated 44,300 bbl., 1,500 bbl. less than March, and Manitoba will drop its take to 13,323 bbl., a 1,421-bbl. decrease. British Columbia will take 60,920 bbl., compared with 62,975 in March.

The biggest cut in U. S. imports comes from the Puget Sound area where nominations by General Petroleum Corp. totaled 16,184 bbl., down 7,717 bbl. General Petroleum will make up the difference from its own production.

Nominations of other U. S. refiners, compared with March figures, are: International Refineries, Inc., Wrenshall, Minn., 8,300 bbl., a 200-bbl. increase; Bay Refining Corp., Bay City, Mich., 3,000 bbl., 1,000 bbl. less; Lake Superior Refining Co., Superior, Wis., 2,000 bbl., no change; and West Branch Refining, Inc., 300 bbl., no change.

Big Birthday Party

will climax oil's centennial at Titusville on August 27.

TITUSVILLE, Pa., will be the Mecca for oil's centennial celebration this summer.

Oil Centennial, Inc., a nonprofit group, will spearhead the anniversary program at the site of the Drake well which gave birth to the industry in 1859.

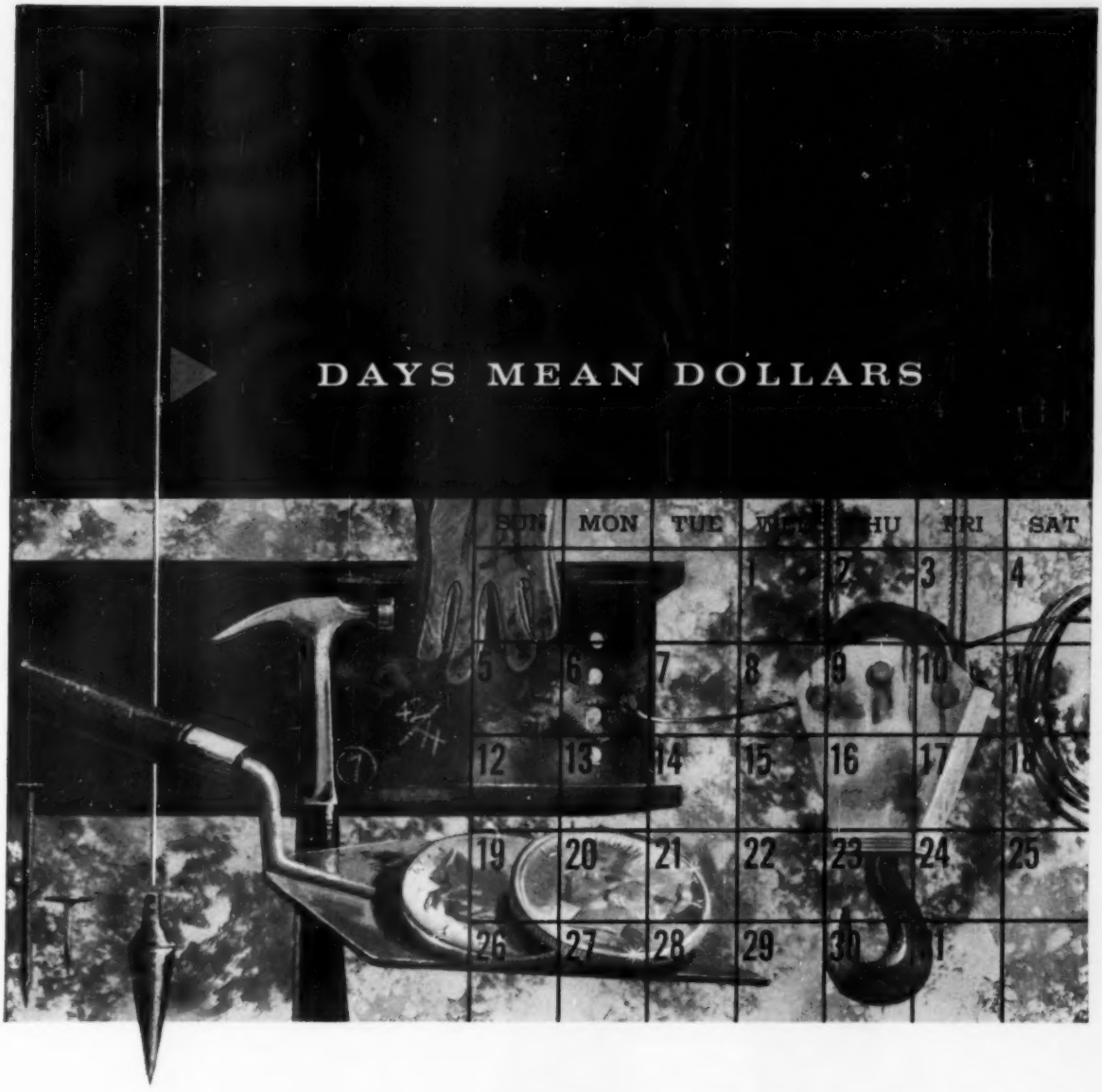
August 23-29 will be proclaimed "Colonel Drake Week" in Pennsylvania, and a series of events will lead to the big celebration on Thursday, August 27. That's the day Col. Edwin L. Drake completed drilling the well a century ago.

The Titusville program will include talks by prominent oil-industry people and government officials, including Gov. David L. Lawrence of Pennsylvania.

Events will include an oil-country barbecue, the unveiling of a pipeline monument at the site of the world's first oil pipeline, burial of sealed documents to be opened in the year 2000, and the sending of messages to Titusville by pipeline.

Chairman of the centennial group is J. P. (Dick) Jones, Bradford, Pa., and president is Ned H. Dearborn, Titusville. Harry A. Logan, Jr., president of United Refining Co., Warren, Pa., is chairman of the group's oil-industry division.

The Titusville observance will be one of the most important centennial celebrations in the country. But the industry is observing the birthday in many other ways.



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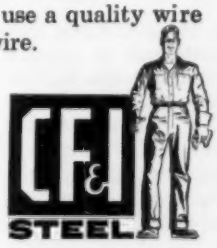

WICKWIRE ROPE

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6631

Iran's Offering Aimed at Expansion

- **Remoteness of acreage open for bids will be factor in price.**

IRAN is opening thousands of square miles of remote interior to competitive bidding.

The move is a further courtship of oil companies by National Iranian Oil Co. under the 2-year-old oil law. This legislation was designed to expand the oil industry in Iran beyond the coastal area assigned to the consortium group of companies.

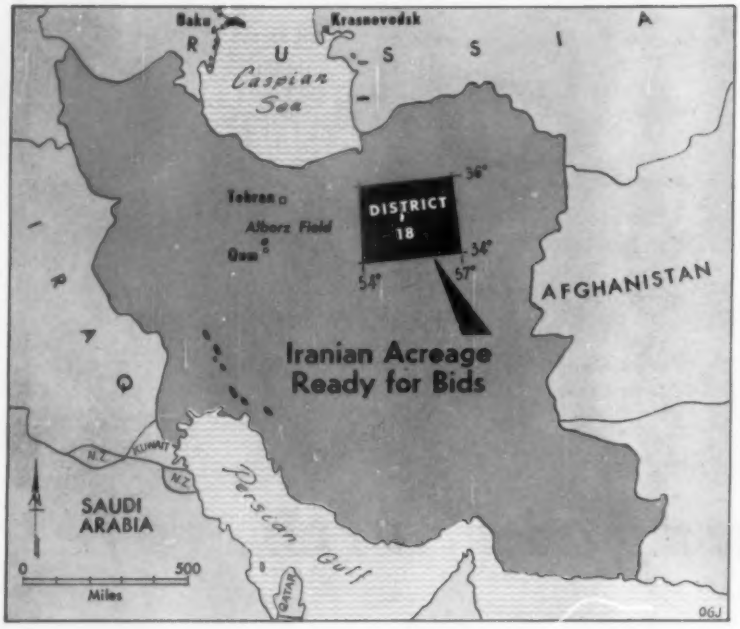
The area involved is the newly defined District 18, lying in northeast Iran, east of Tehran. Boundaries of the district are the actual meridian lines, 54° and 57° East longitude, and 34° and 36° North latitude.

Companies have until July 1 to obtain details from the NIOC chairman in Tehran or the Iranian Embassy in Washington. Firms which already have established technical and financial competence in connection with earlier applications will not have to repeat this part of the procedure.

The oil law specifies three types of bids. Companies can make an independent application for acreage, plus a bonus offer, in proposals similar to those made in Venezuela 3 years ago.

The second type of bid, which has been the only kind successful so far, is an offer based on a joint partnership deal with NIOC. The third possibility is a bid offering NIOC a limited partnership, but with at least 30% interest.

Proposals must be turned in by September 1. Bids will be examined within 2 months after the deadline, and the outcome will be announced "in due course."



Location remote . . . District 18 lies deep in the Iranian hinterland.

The western border lies about 150 miles east of Tehran and about 175 miles east of Alborz field, where NIOC is trying to follow through on its spectacular find 3 years ago. The northwest portion of the district lies on part of what was a proposed Soviet-Iranian concession that was rejected 12 years ago.

Some industry executives in the past have pointed out the transportation handicap faced by oil ventures in interior Iran. The drawback is that even prolific crude production would still have to be carried hundreds of miles to the Persian Gulf. There it would have to compete with other prolific oil produced near tidewater.

Production east of Tehran, however, might possibly be tied into the system which Iran some day hopes to

Concessions in Iran Are Costly

INDIANA Standard's deal with Iran is an indication of what it costs to enter the Middle East oil search. Indiana made the deal last year, outbidding the world's biggest oil companies.

Here's the way Indiana describes its contract with National Iranian Oil Co. in its recently released annual report:

"Our most important foreign prospect to date consists of 6,000 sq. miles of Iranian offshore waters in the Persian Gulf. This is commonly considered one of the most highly prospective areas for oil development in the world and was one of the last prime Middle East prospects available.

"Our agreement with National Iranian Oil Co., reached in April 1958, called for our paying a $25-million cash bonus, plus an exploration commitment to spend $8.5 million annually in the first 4 years and an additional $6 million per year during the next 8 years.

"We may discontinue exploration without further obligation at the end of the fourth year or any year thereafter provided the obligation for exploration expenditures up to that time has been fulfilled.

"We are to bear all exploratory costs, but development expenses will be shared equally with our partner, National Iranian Oil Co., except to the extent that we elect to satisfy our exploratory obligation by spending equivalent sums for development.

"Profits before taxes will be split with our partner, NIOC. Our share of the profits will then be subject to a 50% Iranian income tax. In computing Iranian income taxes, the cash bonus will be amortized."

build to the Mediterranean. Legal spadework has been carried out by Iran and Turkey. Last year the countries reached a tentative agreement for a 1,000-mile, big-inch system to terminate somewhere along the Mediterranean Coast of Turkey.

The plan has been contingent on the discovery of sufficient reserves in the Qum area, where NIOC has so far had disappointing results trying to repeat the success achieved at Alborz. If reserves are developed in District 18, presumably they might help bring to life the Iran-Turkey-Mediterranean proposal.

Other concessions . . . Awards made earlier to two companies under the new law caused reverberations still felt in the industry.

A subsidiary of the Italian Government oil agency, ENI, tied down choice acreage in the Persian Gulf along with two other concessions by offering NIOC a full, but nonpaying partnership. Besides agreeing to absorb all exploration costs and to split any profits with NIOC, the Italian company will split its profits a second time with the government.

The second deal was made with Standard Oil Co. (Ind.). Besides agreeing to split with the government, and again with NIOC, the company added a $25-million bonus, and promised to spend $82 million in exploration over a 12-year period.

Iran Pan American Oil Co., the joint NOIC-Indiana Standard Co., expects to spud its first well in the Persian Gulf by July 1.

A drilling barge is now en route to Iran and is expected to arrive about June 1. A tender to work with the barge is being outfitted in Galveston and is scheduled to leave the United States in late April.

Indiana Standard acquired its barge from De Long Corp., which built it originally for Offshore Co. before the doldrums hit Gulf of Mexico drilling activity.

A Canadian-based company, Sapphire Petroleums, Ltd., has acquired two small blocks totaling 386 sq. miles bordering the Gulf of Oman. It secured the rights in a 50-50 partnership agreement with NIOC and must spend $18 million over a 12-year period.

Several other bids for remaining Persian Gulf acreage have been turned down, reportedly because NIOC has shunned bonus deals that would not include partnership for itself.

One of the questions companies may be asking themselves is whether NIOC will still insist on a partnership arrangement on acreage far inland.

Sun Is Building New Pipeline in Lake Maracaibo

A NEW pipeline being built by Venezuela Sun Oil Co. in Lake Maracaibo will run due north from Block 1 to Punta de Palmas terminal.

The 18-in. system will handle 100,000 bbl. daily from an automatic-flow station expected to go into operation by September. Present production of 32,000 bbl. daily is being removed from a storage ship by barge to the terminal, which is partially owned by Sun.

The company estimates that its Venezuelan reserves have increased 66 million barrels by the development of the northern part of Block 1, in which it is operator and owns 45% interest. Its partners are Venezuelan Atlantic, with 45%, and Texaco Seaboard, 10%.

ENI Forms Pipeline Company

A COMPANY has been organized to build a proposed 250-mile 24-in. crude pipeline from Genoa, Italy, to Aigle, Switzerland.

Sta. per Azioni Oleodotti Internazionali is two-thirds owned by the Italian state oil agency, ENI, through one of its subsidiaries, SNAM. European investors hold the remaining third interest through Ste. Finanicere Italo-Suisse, Geneva.

Enrico Mattei, ENI chairman, is chairman of the pipeline company. A Swiss banker, Salvador Amon, is vice chairman.

The system will feed a refinery to be built in Switzerland. An extension may be built to West Germany later (OGJ, Feb. 9, p. 85). Cost of the line into Switzerland is expected to be comparatively high because of a 7½-mile tunnel planned through Great St. Bernard Mountain.

Australian Search

launched with first well on Innamincka anticline.

THE DELHI - SANTOS - FROME combine last week spudded in its first wildcat in Australia — a projected 14,000-ft. test in the Innamincka area of South Australia near the Queensland boundary.

Simultaneously, the combine announced the signing of a firm contract calling for a joint exploration and drilling program under 97,000 sq. miles of concessions in the Great Artesian basin of South Australia and Queensland.

The contract follows a preliminary agreement reached by the same firms earlier in the year (OGJ, Jan. 12, p. 67).

Participants in the contract are Delhi Australian Petroleum, Ltd., Santos, Ltd., and Frome Broken Hill Pty., Ltd.—each holding a one-third interest.

The deal calls for Delhi and the Frome group to spend a minimum of $2,045,000 in the 2 years beginning January 1, 1959. The money will go for drilling of three wells plus geological and geophysical work. If subsurface data from these first tests are encouraging, the group will hike its outlay to a minimum of $10,700,000 by the end of 1963.

Santos, having contributed the acreage, is not required to provide any part of the exploration funds. If commercial production is found, however, the three parties will contribute equally to development expenses.

Santos is an Australian exploration company. Delhi Australian is a subsidiary of Delhi-Taylor Oil Corp., Dallas. The Frome group is a venture of Standard Vacuum, British Petroleum Co., Ltd., Interstate Oil, Ltd., and American Metal Climax Co.

Ethiopian Search Planned

A WEST GERMAN company has signed a 50-year prospecting agreement with Ethiopia.

Gewerkschaft Elwerath obtained the rights in Ogaden province in the eastern part of the country. The area was held under concession by Sinclair Petroleum Co. until 2 years ago. Sinclair had acquired rights over all of Ethiopia in 1945. It gave up the western half in 1951 and pulled out of the remaining southeastern section in 1957 after negative results in a shallow and medium-depth drilling program.

Owners of Elwerath include Wintershall, Royal Dutch-Shell, and Jersey Standard, which holds 14.4%.

Close Scrutiny of Arab Hopes

. . . suggested by Jersey's Howard Page on eve of Cairo conference. Oil men should help achieve practical aims.

ARAB OIL countries are preparing for a gathering of the Clan in Cairo.

Unless friction between Egypt and Iraq causes a last-minute postponement, Arab League members will meet April 14 to study royalties, production, prices, concession rules, and plans for a new pipeline.

Reports from the Middle East are that Iraq has decided to boycott the meeting. But there has been no indication from Cairo that this would upset plans.

But as time for the conference nears, an executive of the world's largest oil company spoke out on the delicate, emotion-packed subject of oil-country aspirations.

Howard W. Page, director of Middle East affairs for Standard Oil Co. (N. J.), told a Middle East Institute conference that operating oil companies should separate the sound Arab hopes from the impractical plans and should not go along on the latter.

Some of the less-practical ideas being proposed, Page said, include:

. . . **A desire** to operate abroad. There are people in several countries who still aspire to get into the "competitive jungle of transportation, refining, distribution and marketing of oil in other countries."

It takes 3 billion dollars' investment to move 1,000,000 bbl. daily from the Persian Gulf to Northern Europe, refine it, and distribute the products. With so many good uses for that money in their own country, Page said, it is surprising to see a continuing hope of foreign operations. Besides, he said, the return from such investment is low.

. . . **A desire** for industrialization. National pride, Page said, often demands a steel mill, a refinery, and, nowadays, a petrochemical plant. These may be desirable, "but to build one of those plants which could never pay its way is a waste of valuable materials and manpower."

. . . **Insistence on refineries.** Oil companies, Page said, take quite a kicking around from consuming countries for not building or expanding refineries fast enough and from producing countries for not refining the crude at its source.

"In a situation where there is more than an adequate supply, it is the consumer that calls the tune."

. . . **Promotion of nationals.** Page was critical of those "who want to place nationals in high positions willy-nilly."

"The industry is often criticized for not pushing nationals fast enough. I am one who feels that the industry should not demand of them the same standards of education, experience, and proven ability that we do of our own people.

"True, this may result in some lack of efficiency and some mistakes, but they may well be worth it if it speeds up the process of developing competent nationals for higher positions."

It is harmful, though, to put a man in a job well beyond his ability. And his failures can reflect unfairly on the reputation of his countrymen, as well.

The pipeline . . . Page said that basically a large-diameter pipeline from the Persian Gulf to the Mediterranean should show a better return than do tankers.

"At present there are some 300 tankers tied up and many operate at reduced speeds to keep them in service and their crews employed. New tankers are coming off the ways in record numbers. Tapline is operating well below maximum capacity. Therefore this is not a project which could come into being very soon."

He said, however, that such a project needs several years for organizing, financing, engineering, and in building. The transportation picture could change in this time, particularly if it were planned that way to fit additional pipeline capacity.

French Hit Again

in Paris basin. It's most promising find so far.

ANOTHER discovery has been made in the Paris basin, and it's the best looking yet.

Brie 101, located 31 miles southeast of Paris, is expected to produce 330 bbl. daily of 35°-gravity crude.

RAP, the government-controlled operating company, encountered the sulfur-free oil in two zones of Dogger limestone from 5,340-60 ft. and 5,380-85 ft. A combined test of both zones yielded a flow at the rate of 22 bbl. per hour. The well is temporarily producing 470 bbl. daily while tests continue.

Brie 101 is less than 10 miles east of the small Chailly-en-Biere field brought in last year. The company has two more rigs drilling in the same area. A test at Nangis is drilling ahead at 8,200 ft. Brie Montmirail 202 has been bottomed at 3,904 ft., and the rig was moved for a test of Joinville 101.

RAP earlier this year brought in a 75-bbl.-daily well, Grandville 101, in Aube District. Two other fields found in the Paris area last year, Coulommes and Chateaurenard, are on small commercial production (OGJ, Jan. 26, p. 116).

Fertilizer Plant

nears completion in Peru. It's the country's first.

PERU'S first synthetic ammonia plant—the second in South America—will go on stream in April.

The plant, located at Callao (the seaport for Lima), has a capacity of 20,000 metric tons per year (roughly 67 short tons per day) of anhydrous ammonia. It will also produce ammonium sulfate and ammonium nitrate fertilizers, nitric acid, and ammonium nitrate.

The $10,000,000 Callao facilities will be operated by Fertilizantes Sinteticos S.A. (FERTISA) with headquarters in Lima. Most of the $5,000,000 capital of Fertisa was subscribed by Peruvian investors. Remaining financing was secured on a long-term loan from an Italian bank.

The Fertisa plant is the first in South America to make hydrogen for ammonia synthesis by partial com-

WORLD

Liberian acreage has already been selected under terms of a new concession agreement with American Liberian Exploration Corp. The new Oklahoma City firm has selected 400,000 acres adjacent to Monrovia, capital of the small West African republic. Further geological study will be made before the remaining 1,100,000 acres are selected. The company was formed by 10 individuals; Spencer Chemical Co., Kansas City; and Kingwood Oil Co., Oklahoma City. Richard Robinson is president.

A new 32,000-bbl. refinery near Bordeaux, France, has been placed on stream by Esso Standard S.A.F.

The plant was designed to process crude chiefly from Parentis and smaller fields in southwestern France.

A 60-mile 12-in. crude pipeline from Parentis was built in time to

bustion of fuel oil, using the Fauser-Montecatini process. The fuel oil is available in ample quantities from northern Peru.

In producing fertilizer-grade ammonium nitrate, the plant also will use a granulating device based on revolving disks to make a prilled product suitable for direct application to the soil. This device, used by European pharmaceutical and candy industries, is now being employed for the first time in the Western Hemisphere in fertilizer manufacture.

The other South American synthetic ammonia plant is operated by Petrobras, Brazilian government oil agency, at Cubatao near Sao Paulo. This plant uses refinery gas to make hydrogen by the Texaco partial-combustion process. Petroleos Mexicanos has announced it will build three synthetic ammonia plants in Mexico at a cost of $20,000,000.

West German Runs Due Hike

WEST GERMANY refinery runs may increase by 100,000 bbl. daily this year.

Estimates based on reports by local refiners indicate throughput may pass the 400,000-bbl.-daily mark. Half the anticipated gain will be accounted for by the new refinery of Esso, A.G., at Cologne. Increased volume also will be handled in expanded plants of Royal Dutch-Shell at Hamburg-Harburg and Scholven at Gelsenkirchen.

Domestic crude will supply less than one-quarter of local needs, averaging about 90,000 bbl. daily.

Gas Price Is Set by French

. . . in Algeria's Hassi R'Mel field. Government plans call for $40-million pipeline, construction of steel plant.

THE PRICE of gas from the giant Hassi R'Mel field in Algeria has been fixed by the French Government.

Gas from the shut-in field will sell for 20 cents per M.c.f. based on a conversion of 3.5 francs per cubic meter. The price was set at the same time the government decided to go ahead with plans for a steel plant at Bone.

The project calls for a $40-million gas pipeline from Hassi R'Mel to a generating plant at Bone, which would supply power for a 400,000-500,000-ton-per-year steel mill. A line about 400 miles long would be necessary. The program could be completed within 3 years.

Supply source . . . The initial price of Hassi R'Mel gas is of interest because the big field is a likely source of supply if and when methane starts moving in international markets on a commercial scale.

The French estimate the field's proved reserves at 17 trillion cubic feet, with probable reserves of 28 trillion. The field also lies far closer to Europe than possible alternative sources of supply in the Caribbean or Middle East.

One French official estimates that Sahara gas will be exported in from 5 to 10 years. He believes the North African gas might be sold in the Ruhr for 22.9 cents per M.c.f., based on a conversion of 4 francs per cubic meter. Gas sold at this price, however, would require a field cost of only a fraction of the present posting.

A study committee of the consultive assembly of the economic committee of the Council of Europe has proposed a plan by which Algerian gas would move to Europe through a system of pipelines under the Mediterranean and by tanker. Its computations were based on an assumed price of 10.2 cents per M.c.f. at the source (OGJ, Jan. 26, p. 114).

Colombian Wildcat Spudded

A WILDCAT has been spudded in Colombia's lower Magdalena River basin by a subsidiary of Ambassador Oil Corp. of Fort Worth.

Amkirk Petroleo Corp. expects to take El Campito 1 to 3,500 ft. The well will test Eocene sands on a block of about 24,000 acres on a farmout from International Petroleum Co. of Colombia, a subsidiary of Jersey Standard and Mobil Petroleum Co.

The well is 2 miles northwest of Barranquilla on a seismic structure of considerable size. Closest production is 85 miles away.

BRIEFS . . .

coincide with completion of the refinery at Bec d'Ambes. Products will be moved to markets in southwestern France by waterways, rail, and highway.

Northern Ireland will get a refinery if negotiations involving the local government and Shell-Mex and B.P. are successful. Location and plant size have not been decided on, but Londonderry is a possible site. Completion of the project is at least 3 or 4 years in the future.

A 1,000-ton Udex unit has opened at Shell Refining & Marketing's 105,000-bbl. refinery at Stanlow, England, and a gas-treating plant is slated for construction. The Udex unit, designed by UOP, is supplied with feedstock by an existing Platformer. The gas-treating plant will process refinery gas to be sold to the North Western Gas Board under a 10-year contract starting in the mid-1960's.

The giant coal-to-oil plant at Coalbrook, South Africa, is expected to show a profit for a first time this year. The $130-million facilities of South African Coal & Gas (SASOL) have been producing about 2,400 bbl. daily of products, of which less than 100 bbl. daily is gasoline.

The 387-mile 24-in. pipeline from Hassi Messaoud field to Bougie, Algeria, has passed the halfway mark on its way north. The remaining 193 miles will be built by October.

Underground storage will be developed in Japan to help Tokyo Gas Co. meet peak winter demand for manufactured gas. Ball Associates of Denver will help select storage formation and will supervise drilling of input and withdrawal wells. Drilling will be done by Teikoku Oil Co.

Signal Oil & Gas of Venezuela has completed its eleventh well on a 28,000-acre Lake Maracaibo concession. The well flowed at the rate of 5,380 bbl. daily from a lower Eocene sand. Signal, operator for itself, Pure Oil Co. and Standard Oil Co. (Ohio) is producing the lease at a rate of 25,000 bbl. daily from 11 wells.

Two more good producers in Lake Maracaibo's Block 17 have been completed by Phillips Petroleum. A south extension, LPG 16-5, flowed at the rate of 6,384 bbl. daily. The LPG 12-6, a north stepout, flowed 6,696 bbl. daily. Both are producing from a thick pay section of Eocene sand. The field now has four producers, with a fifth well drilling and another north stepout scheduled soon. Phillips is operator for a seven company group.

World Production Climbs to New Peak

• Venezuelan production breaks 2½-year-old mark. U.S. and Canada show gains, while Middle East countries as a whole dip slightly.

FREE-WORLD crude production started the year with a gain that sent output to another all-time high.

The January record was accounted for by gains in the Western Hemisphere. Output in Venezuela was higher than ever before, breaking the old record that had stood for 2½ years. Both the U. S. and Canada also had increased levels.

Middle East countries on the balance had a slight decline. Small increases in Iraq and Iran were more than offset by declines in Kuwait and Saudi Arabia.

The year got under way with crude production up more than 1,300,000 bbl. daily from the beginning of the preceding year. At the same time, there was relatively little change in the share of oil supplied by leading centers. The U. S. supplied about 43%, compared with 45% a year earlier; Venezuela, 18%, compared with 16%. The Middle East produced about 26% of the oil in each period, and other areas, 13%.

TREND OVER THE LAST YEAR

	Western Hemisphere, less U.S.	Middle East	Total Free World outside U.S.
1958			
January	3,685.7	4,036.6	8,477.7
February	3,798.7	4,057.6	8,662.1
March	3,672.6	4,243.0	8,631.3
April	3,613.5	4,109.2	8,528.0
May	3,582.9	4,087.8	8,468.2
June	3,678.0	4,156.8	8,654.2
July	3,777.0	4,247.2	8,832.6
August	3,828.4	4,334.0	8,971.5
September	3,769.8	4,535.2	9,120.8
October	3,891.3	4,482.3	9,177.5
November	4,037.8	4,472.1	9,309.5
December	4,119.9	4,446.2	9,371.4
1959			
January	4,301.9	4,369.3	9,451.3

World-Wide Crude Production: Daily Average in Thousands of Barrels

Country—	Jan. 1959	Dec. 1958	Jan. 1958
Western Hemisphere			
Argentina	103.0	111.4	97.2
Bolivia	9.1	9.1	10.3
Brazil	57.9	57.4	40.7
Canada	549.0	503.4	494.5
Chile	15.7	15.7	13.7
Colombia	135.0	135.0	129.2
Cuba	0.6	0.5	1.4
Ecuador	9.0	9.0	9.0
Mexico	265.5	265.5	246.7
Peru	54.3	54.3	53.6
Trinidad	108.0	110.1	97.4
Venezuela	2,994.8	2,848.5	2,492.0
Total	4,301.9	4,119.9	3,685.7
Europe			
Austria	51.2	51.2	57.2
France	28.6	28.6	26.5
West Germany	90.6	91.8	78.6
Italy	30.0	30.0	23.5
Netherlands	34.6	34.6	31.0
United Kingdom	1.7	1.7	1.7
Yugoslavia	8.6	8.6	8.5
Total	245.3	246.5	227.0
Middle East			
Bahrain	45.5	45.2	34.6
Iran*	834.0	827.0	847.0
Iraq†	809.9	798.0	617.8
Israel	2.0	2.0	1.2
Kuwait	1,404.2	1,442.7	1,315.4
Neutral Zone	106.2	106.2	77.5
Qatar	167.0	184.0	159.3
Saudi Arabia	994.0	1,034.6	978.4
Turkey	6.5	6.5	5.4
Total	4,369.3	4,446.2	4,036.6

Country—	Jan. 1959	Dec. 1958	Jan. 1958
Other Asia			
British Borneo	104.6	104.6	112.5
Burma	10.5	10.5	7.1
India	8.5	8.5	8.7
Indonesia	300.0	325.0	311.7
Japan	7.6	7.6	6.8
New Guinea	5.1	5.1	5.5
Pakistan	5.9	5.9	5.9
Total	442.2	467.2	458.2
Africa			
Algeria	11.3	11.3	2.5
Angola	2.0	2.0	
Egypt	58.9	58.9	59.8
Gabon	12.3	11.3	6.4
Morocco	1.5	1.5	1.5
Nigeria	6.6	6.6	
Total	92.6	91.6	70.2
Free World			
Foreign	9,451.3	9,371.4	8,477.7
United States	7,223.0	7,136.0	6,865.0
Total	16,674.3	16,507.4	15,342.7
Communist Countries in Soviet Orbit			
Romania	250.0	235.0	235.0
Russia	2,300.0	2,260.0	2,260.0
Others	60.0	60.0	60.0
Total	2,610.0	2,555.0	2,555.0
WORLD TOTAL	**19,284.3**	**19,062.4**	**17,897.7**

*Includes 5,000 bbl. daily from Naft-i-Shah field not operated by consortium. †Includes estimated 3,300 bbl. daily from Naft Khaneh field, operated by Iraq Government. Figures are from reliable sources. Estimates are made where complete reports are lacking.

What Transco learned about

Internal coating of gas pipelines

PRELIMINARY RESULTS of 87 flow tests on both bare and internally coated 30 and 36-in. pipeline indicate an interesting increase in pipeline flow efficiency for coated pipe.

Over-all capacity of the Transco system has not been materially improved yet by coated pipe. During the experimental period with internal coating, no long, continuous sections of coated pipe have been installed. This was partially due to the fact that the process was new and we were unable therefore to obtain coated pipe in many instances and partially due to our deliberately leaving sections of pipe uncoated so that tests could be made between coated and uncoated pipe for comparative purposes.

With the experience we have had and the experience of coating contractors during this developmental period, we feel that we are justified in designing for and considering the effects of internal coating on all main-line additional facilities for expanding our system.

BY RAYMOND H. CROWE
Chief Engineer
Transcontinental Gas Pipe Line Corp.

Transcontinental Gas Pipe Line has internally coated 1,199 miles of pipeline ranging in sizes from 20 to 36 in. in diameter during the past 4 years. All of this pipe was internally coated either at the pipe mill or at a railhead prior to being welded into the line.

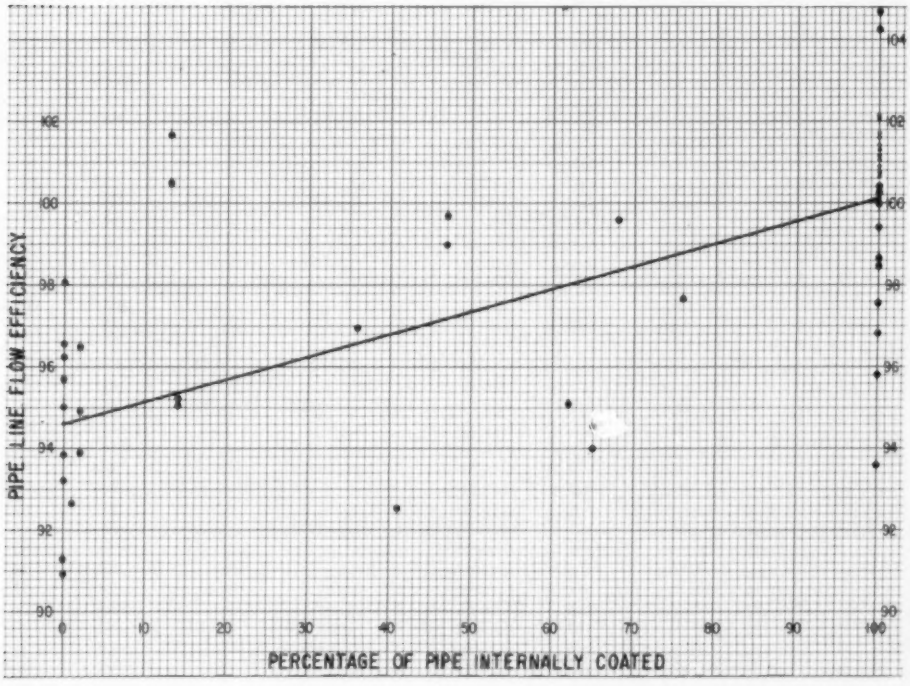
Table 1 contains many of the actual data taken during the tests. Fig. 1 is a curve drawn through the results obtained from the data contained in Table 1 for 36-in. pipe and Fig. 2 is a curve showing the results for 30-in. pipe. Various percentages of pipeline were coated on different sections.

The pipe was purchased from various pipe mills and at various times so that it was not always possible to obtain coated pipe. Also when it could be determined definitely that the pipe would be laid within a very short time after rolling, the coating was intentionally omitted since at the time there was no definite information as to the advantage of internal coating.

Three years' experience . . . Transcontinental first gave consideration to the idea of internally coating pipelines after we learned that the Columbia Gas System had internally coated a short section of small-diameter pipe and that equipment was available to do such work. We decided to try internal coating on a portion of the pipe which we were installing in 1955.

Our reason for trying internal coating was that although the original design of the Transco system was based on an "E" factor of 96% for 30-in. pipe in the Panhandle "A" flow formula, it was discovered after the system was placed into operation that this factor was too high. Actual operating data revealed efficiencies ranging from 86 to 93% on crosscountry sections of our 30-in. pipeline.

Efficiency studies . . . Studies were then made to determine possible causes for the lower-than-design efficiencies. After much checking, we learned that the sections of the pipeline with the lowest flow efficiencies were laid with pipe that had been stored longest in the weather before installation. Fig. 3 was prepared from the data obtained



E FACTOR (per cent) vs. per cent internally coated 36-in. pipe, based on 59 ammonia tests conducted on 34 pipeline sections between mainline valves. Fig. 1.

Table 1–Tabulation of Pipeline Flow Efficiency Data and Results 36-In. Pipe on the Transco System by Use of the Ammonia-

Pipeline section—	Length of 30-in. o.d. (miles)	Length of 36-in. o.d. (miles)	Per cent internally coated	Date of test	Test run No.	Ammonia travel time, seconds	Barometric pressure (in. of Hg)	Average gas temp. (°F.)	Inlet pressure (P_1) (psig.)
A_1 Injection section	....	12.52	68	6-13-58	1	3,798.0	29.98	104.1	723.5
A_2 Injection section	12.12	....	100	6-12-58	1	2,412.4	30.04	82.2	656.7
A_3 Injection section	....	5.06	100	6-12-58	1	1,262.8	30.04	76.0	609.3
B_1	....	15.25	100	3-11-58	1	.....	.....	79.7	614.8
B_2	....	14.68	100	3-11-58	1	.....	.....	69.3	588.1
B_3	....	14.33	100	3-11-58	1	.....	.....	61.2	559.3
B_4 Injection section	....	14.46	0	3-11-58	1	2,937.3	29.527	55.1	532.4
B_1	....	15.25	100	3-11-58	2	.....	.....	80.6	614.7
B_2 Injection section	....	14.68	100	3-11-58	2	3,239.0	29.497	70.4	588.1
B_3	....	14.33	100	3-11-58	2	.....	.....	62.1	559.3
B_4	....	14.46	0	3-11-58	2	.....	.....	55.4	532.2
C Injection section	....	13.32	0	2-12-58	1	3,372.8	30.185	106.2	731.4
C_1	....	17.07	100	2-12-58	1	.....	.....	88.0	709.0
C_2	....	17.41	100	2-12-58	1	.....	.....	73.0	683.3
C Injection section	....	13.32	0	2-12-58	2	3,378.0	30.176	106.2	730.0
C_1	....	17.07	100	2-12-58	2	.....	.....	88.0	708.5
C_2	....	17.41	100	2-12-58	2	.....	.....	73.0	682.7
D_1	....	18.48	100	3-27-58	1	.....	.....	72.3	684.3
D_2	....	8.69	0	3-27-58	1	.....	.....	65.9	657.9
D_3 Injection section	....	12.04	0	3-27-58	1	3,185.0	29.73	63.1	641.7
D_4	14.46	....	100	3-27-58	1	.....	.....	58.0	627.6
D_1	....	18.48	100	3-27-58	2	.....	.....	72.5	684.2
D_2	....	8.69	0	3-27-58	2	.....	.....	66.0	657.8
D_3 Injection section	....	12.04	0	3-27-58	2	3,210.0	29.73	63.0	641.7
D_4	14.46	....	100	3-27-58	2	.....	.....	58.4	627.6
E	....	15.13	14	2-11-58	1	.....	.....	93.2	792.4
E_1 Injection section	....	17.49	47	2-11-58	1	4,885.5	30.95	81.3	771.1
E_2	....	14.89	100	2-11-58	1	.....	.....	72.2	743.4
E	....	15.13	14	2-11-58	2	.....	.....	93.6	792.0
E_1 Injection section	....	17.49	47	2-11-58	2	4,885.0	30.95	81.2	770.6
E_2	....	14.89	100	2-11-58	2	.....	.....	72.3	743.3
E_4 Injection section	....	14.79	0	7-10-58	1	3,517.1	29.77	75.0	598.5
E_4 Injection section	....	14.79	0	7-24-58	1	3,377.0	29.30	74.3	586.4
F_1	0.29	18.22	77	7- 8-58	1	.....	.....	95.9	675.7
F_2	....	13.82	100	7- 8-58	1	.....	.....	86.8	643.4
F_3 Injection section	....	14.17	100	7- 8-58	1	3,311.0	29.185	81.3	620.4
F_4	....	17.23	100	7- 8-58	1	.....	.....	76.0	597.4
G	....	13.86	100	2- 7-58	2	.....	.....	80.2	781.0
G_1 Injection section	....	18.02	100	2- 7-58	2	5,251.0	30.04	69.7	758.8
G_2	....	16.07	100	2- 7-58	2	.....	.....	61.8	736.6
G_3	....	16.20	100	2- 7-58	2	.....	.....	57.0	713.0
G	....	13.86	100	2- 7-58	3	.....	.....	80.2	781.0
G_1 Injection section	....	18.02	100	2- 7-58	3	5,254.0	30.04	69.7	759.0
G_2	....	16.07	100	2- 7-58	3	.....	.....	62.0	736.7
G_3	....	16.20	100	2- 7-58	3	.....	.....	56.6	713.4
H_2	....	15.43	65	3-26-58	1	.....	.....	56.5	611.0
H_3 Injection section	....	16.33	100	3-26-58	1	3,907.0	29.09	54.0	586.5
H_4	....	15.85	13	3-26-58	1	.....	.....	52.0	561.4
H_2	....	15.43	65	3-26-58	2	.....	.....	58.5	611.1
H_3 Injection section	....	16.33	100	3-26-58	2	3,880.0	29.09	55.3	586.5
H_4	....	15.85	13	3-26-58	2	.....	.....	53.5	561.9
I	....	12.03	2	7-16-58	1	.....	.....	102.5	743.6
I_1	....	11.46	2	7-16-58	1	.....	.....	90.7	725.7
I_3	....	13.72	2	7-16-58	1	.....	.....	85.3	713.1
I_4 Injection section	....	14.57	41	7-16-58	1	4,104.4	30.04	80.1	691.8
I_5	....	14.81	62	7-16-58	1	.....	.....	74.6	669.3
J_1 Injection section	....	14.93	76	6-10-58	1	3,744.0	30.28	76.6	592.3
J_2	....	9.57	36	6-10-58	1	.....	.....	73.4	571.7
K	....	8.90	1	6-10-58	3	.....	.....	99.1	682.6
K_1 Injection section	....	14.01	0	6-10-58	3	3,997.0	28.98	84.0	670.2
K_2	....	17.21	0	6-10-58	3	.....	.....	73.5	652.2
L	8.96	....	0	6-16-58	1	.....	.....	95.2	690.0
L_1 Injection section	18.04	....	0	6-16-58	1	4,773.0	29.25	84.6	672.6
L_2	16.98	....	0	6-16-58	1	.....	.....	73.7	637.1
M	15.68	....	0	6-18-58	1	.....	.....	84.0	800.0
M_1	21.39	....	18	6-18-58	1	.....	.....	70.0	773.3
M_3	11.77	....	100	6-18-58	1	.....	.....	68.0	744.0
M_4 Injection section	15.72	....	87	6-18-58	1	4,578.0	29.17	67.0	722.5
N_1 Injection section	15.26	....	100	6-20-58	1	3,456.0	29.29	67.2	583.0
N_2	10.35	....	100	6-20-58	1	.....	.....	62.0	550.0

Obtained on Tests Conducted on 30 and Injection Method

Outlet pressure (P_2) (psig.)	Inlet valve elevation (ft.)	Outlet valve elevation (ft.)	Specific gravity (air = 1.000)	Computed "E" factor — Including supercompressibility (%)	Computed "E" factor — Excluding supercompressibility (%)	Roughness Factor K (in.)
710.3	60.43	25.11	0.600	99.570	95.188	0.000383
619.1	27.14	31.07	0.602	94.351	90.027	0.000435
600.0	38.83	115.67	0.602	93.591	89.341	0.000734
588.1	181.00	229.09	0.600	100.220	95.836	0.000300
559.3	229.09	328.33	0.600	96.800	92.456	0.000459
532.4	328.33	388.71	0.600	99.939	95.415	0.000316
501.8	388.71	409.72	0.600	94.670	90.420	0.000593
588.1	181.00	229.09	0.600	99.385	95.063	0.000334
559.3	229.09	328.33	0.600	95.805	91.537	0.000520
532.2	328.33	388.71	0.600	98.498	94.067	0.000378
501.7	388.71	409.72	0.600	93.810	89.609	0.000663
709.0	409.53	367.02	0.599	93.200	89.151	0.000693
683.3	367.02	376.31	0.599	100.900	96.126	0.000288
660.4	376.31	276.78	0.599	104.730	99.438	0.000190
708.5	409.53	367.02	0.599	95.012	90.889	0.000558
682.7	367.02	376.31	0.599	100.430	95.682	0.000305
659.7	376.31	276.18	0.599	104.250	98.987	0.000202
657.9	240.24	316.18	0.602	99.368	94.271	0.000387
641.7	316.18	446.69	0.602	91.256	86.514	0.001025
627.6	446.69	178.69	0.602	95.732	90.772	0.000600
573.0	178.69	237.79	0.602	97.841	92.854	0.000268
657.8	240.24	316.18	0.602	98.644	93.591	0.000424
641.7	316.18	446.69	0.602	90.930	86.208	0.001072
627.6	446.69	178.69	0.602	94.998	90.073	0.000659
573.0	178.69	237.79	0.602	97.143	92.205	0.000294
771.1	237.98	125.13	0.597	95.214	90.399	0.000586
743.4	125.13	261.87	0.597	98.998	93.747	0.000384
724.2	261.87	149.20	0.597	100.640	95.135	0.000323
770.6	237.98	125.13	0.597	95.060	90.268	0.000596
743.3	125.13	261.87	0.597	99.855	94.557	0.000347
723.9	261.87	149.20	0.597	100.150	94.677	0.000342
574.9	458.61	446.63	0.593	96.228	92.097	0.000520
562.0	458.61	446.63	0.599	98.059	93.818	0.000407
643.4	542.50	704.34	0.597	97.486	93.352	0.000419
620.4	704.34	748.20	0.597	97.558	93.342	0.000425
597.4	748.20	815.75	0.597	101.060	96.686	0.000280
570.0	815.75	697.48	0.597	98.561	94.313	0.000377
758.8	697.04	913.02	0.600	100.720	95.194	0.000326
736.6	913.02	831.64	0.600	101.420	95.615	0.000309
713.0	831.64	951.02	0.600	101.410	95.463	0.000315
691.6	951.02	918.93	0.600	101.730	95.744	0.000305
759.0	697.04	913.02	0.600	101.280	95.580	0.000305
736.7	913.02	831.64	0.600	101.140	95.350	0.000320
713.4	831.64	951.02	0.600	102.150	96.166	0.000289
692.0	951.02	918.93	0.600	101.620	95.621	0.000309
586.5	874.16	767.17	0.602	93.974	89.148	0.000725
561.4	767.17	745.72	0.602	100.250	95.214	0.000339
536.3	745.72	713.03	0.602	100.500	95.589	0.000323
586.5	874.16	767.17	0.604	94.566	89.739	0.000668
561.9	767.17	745.72	0.604	102.080	96.957	0.000270
537.0	745.72	713.03	0.604	101.660	96.701	0.000279
725.7	713.93	798.76	0.599	93.877	89.623	0.000716
714.1	798.76	596.57	0.599	96.503	91.874	0.000541
691.8	574.11	734.62	0.599	94.928	90.319	0.000656
669.3	734.62	811.51	0.599	92.502	87.990	0.000879
649.3	811.51	748.77	0.599	95.109	90.437	0.000647
571.7	748.42	706.71	0.600	97.724	93.495	0.000458
556.0	706.71	827.02	0.600	96.962	92.798	0.000499
670.2	827.53	830.61	0.604	92.578	88.533	0.000854
652.2	830.61	834.17	0.604	96.533	91,979	0.000555
629.6	834.17	803.70	0.604	94.602	89.954	0.000715
672.6	653	601	0.600	89.466	85.492	0.000970
637.1	601	652	0.600	92.433	88.193	0.000697
600.0	652	769	0.600	90.230	86.012	0.000917
773.3	769	684	0.602	90.690	85.701	0.000917
745.5	684	259	0.602	94.649	89.123	0.000599
722.5	265	460	0.602	100.560	94.800	0.000294
697.5	460	486	0.602	101.130	95.468	0.000270
550.0	257	329	0.602	98.059	93.613	0.000338
530.0	329	226	0.602	101.000	96.464	0.000236

which illustrated graphically the effects of long storage of pipe.

We were convinced that the internal surface of the pipe was being pitted by oxidation and that pipe should be laid as soon as possible after rolling. It was apparent, however, that because of mill rolling schedules and the indefiniteness of pipe-laying schedules, it was not always possible to obtain a desirable pipe-rolling, pipe-installing time schedule.

The Panhandle "A" flow formula as used in the original design of Transcontinental is as follows:

$$Q = 435.87\,(T_o/P_o)^{1.07881}$$

$$\times\,[(P_1^2 - P_2^2)/(G^{0.8539}\,T\,L)]^{0.5394}$$

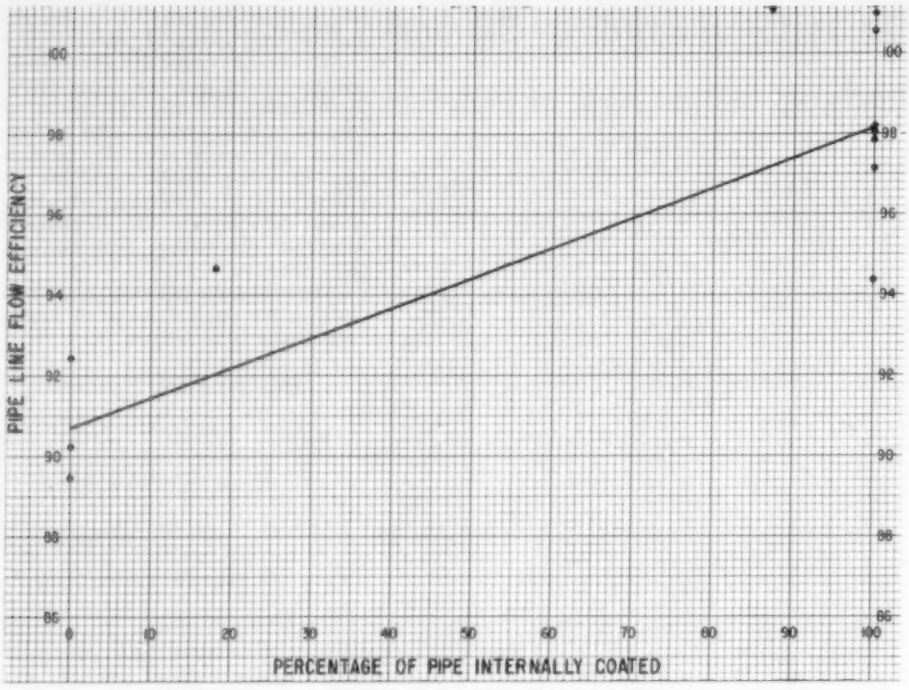
$$\times\, d^{2.6182}\,E$$

- Q = cu. ft. gas per day at pressure and temperature bases P_o and T_o (14.7 psia. and 519.6° F. abs.)
- 435.87 is a constant
- T_o = temperature basis defining a cubic foot of gas, °F. abs. (519.6° F. abs.)
- P_o = pressure basis defining a cubic foot of gas, psia. (14.7)
- P_1 = inlet pressure, psia.
- P_2 = outlet pressure, psia.
- d = inside diameter of pipe, in.
- G = specific gravity of gas (air = 1.000)
- T = actual temperature of flowing gas, °F. abs.
- L = length of pipe, miles
- E = efficiency of pipeline, decimal fraction. (The "E" factor described here includes supercompressibility.)

After the first internally coated pipe was installed in 1955, we wanted to know if internal coating was economically justified, but the pipeline flow-test data failed to reveal conclusive results. At that time Transco's system was only partially looped and the internally coated sections were so short and pressure drop so small that it was virtually impossible to make a positive conclusion.

For the next 2 years although the flow tests showed some indication of increased efficiency, they were not conclusive enough to make our findings public but were encouraging enough for management to take the calculated risk of continuing the program.

Other studies . . . During this development time the pipeline research committee of the American Gas Association instituted Project No. NB-14



E FACTOR (per cent) vs. per cent internally coated 30-in. pipe, based on seven ammonia tests conducted on 12 pipeline sections. Fig. 2.

TABLE 2

Type of 36-in. pipe	Effective surface roughness—in.	Pipeline flow efficiency—%
Internally coated	0.00028	103.8
Very smooth commercial	0.00045	100.0
Average commercial	0.0007	96.5
Stored	0.0013	91.6

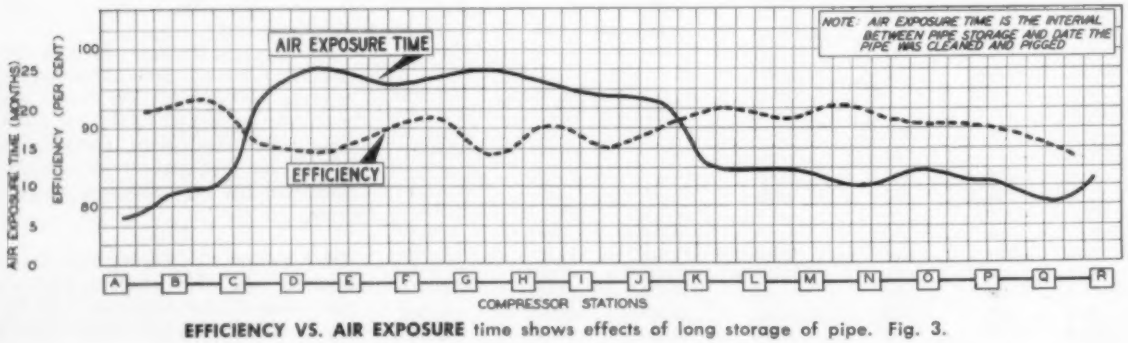
TABLE 3

Pipe size (in.)	Pipe internally coated	Average thickness of internal coating, mils	Length of time pipe exposed to atmosphere, mos.	Effective pipe roughness (in.)
36	No		Just rec'd. from mill	0.00057
36	No		Just rec'd. from mill	0.00086
36	No		Just rec'd. from mill	0.00067
36	No		Just rec'd. from mill	0.00085
36	No		Just rec'd. from mill	0.00070
36	No		Just rec'd. from mill	0.00075
36	No		Just rec'd. from mill	0.00075
	Average			0.00074
36	No		5	0.0013
36	No		6	0.0011
36	No		12	0.0014
36	No		24	0.0016
	Average			0.0013
36	Yes	1¾	3	0.00026
36	Yes	1¾	6	0.00028
36	Yes	1¾	24	0.00029
	Average			0.00028

to investigate internal coatings and Project No. NB-13 to investigate pipeline-flow efficiencies. This work was done through the Institute of Gas Technology at Chicago.

These studies show that for the ranges of flow and Reynolds' number encountered in most large gas-transmission pipelines the flow efficiency is dependent upon pipe roughness and independent of Reynolds' number. The institute obtained specimens of commercial pipe and used the technique of forming a plastic replica of the pipe surface and examining photomicrographs of the replica.

We at Transco use a surface-roughness measurement instrument manufactured by Brush Electronics Co. in determining pipe roughness. This instrument measures the peak heights and valley depths and determines an average finite value of these measurements. As part of its work, the Committee on Project No. NB-13


NOTE: AIR EXPOSURE TIME IS THE INTERVAL BETWEEN PIPE STORAGE AND DATE THE PIPE WAS CLEANED AND PIGGED
AIR EXPOSURE TIME
EFFICIENCY
AIR EXPOSURE TIME (MONTHS)
EFFICIENCY (PER CENT)
COMPRESSOR STATIONS

EFFICIENCY VS. AIR EXPOSURE time shows effects of long storage of pipe. Fig. 3.

has developed a new flow formula in which the effective roughness of the pipe is used as a factor.

Pipe roughness . . . Table 2 is a comparison of flow efficiency with effective surface roughness of the pipe based on this new flow formula. These flow efficiencies assume an effective surface roughness of 0.0045 in. (very smooth commercial pipe) to be 100% efficient.

Table 3 is a tabulation of effective pipe roughness measured on various samples of pipe along Transco's system.

A study of Table 3 reveals that internally coated pipe subjected to atmosphere for long periods of time is not affected while bare pipe is affected considerably and would result in loss of several per cent of flow efficiency.

The information obtained from Project NB-13 and Project No. NB-14 was available to Transco and was of sufficient importance to us to justify Transco's going on with the internal coating.

Internal-Coating Methods

Engineering studies indicated that the most desirable type of paint to use for internal coating was one of the epoxy-resin type. This type of paint had been used successfully by the Columbia System and had given every indication of good performance. Results obtained since that time in Project NB-14 have apparently confirmed this thinking. Therefore, all of the internal coating done by Transcontinental has been with epoxy paint.

Original thinking on the application of an internal coating was concerned with the coating being given every opportunity to develop the strongest possible bond to the pipe wall. Since a property of the epoxy paint was its chemical cure and bond to the pipe, it was felt that the pipe wall should be chemically clean and neutral.

Pickling operation . . . The early applications therefore involved a pickling bath to rid the pipe surface of contaminants. This process included acid bath, fresh-water neutralizing rinses, and hot-air drying. Control of the pH of the newly cleaned surface was critically held to 7-8, as a pH in any other range affected the paint chemically and jeopardized the result desired.

The pipe was coated with a minimum thickness of 1½ mils cured of an epoxy-resin paint. The 36-in. pipe was coated at a cost of approximately 35 cents per foot. This pickling and painting was done at the pipe mill on one job. On another order of pipe it was not necessary to pickle since that particular manufacturer pickled the plate before being manufactured into pipe. In that case it was necessary only to give the pipe a light brushing before the application of the epoxy.

Brush cleaning . . . As the internal coating applications increased, it became apparent that the possibility existed that a surface other than that described above could be painted with this same material. Mill scale still on the pipe wall had been a large single factor of concern. It was found, however, that any mill scale which was tightly and firmly bonded to the pipe wall was not going to jeopardize the coating, once painted over.

Mechanical-power brush cleaning was therefore adopted as a standard method of cleaning in pipe fabricated from plate rolled into pipe. Any scale which does not break from the pipe wall during the pipe-shaping process, the cold expanding, or the mechanical brushing, has become to be considered tightly bonded scale. Experience from painting over this has not revealed any detrimental effect of this approach.

Considerable work has been done at various locations in different environment to check surface roughening due to atmospheric exposure of steel-plate pipe and the smoothing effect of internal coating—even on new pipe right out of the mill. In all cases, observations have indicated the improvement in surface roughness on brand-new pipe. Wherever and whenever practical, Transco has contracted to apply internal coating on pipe immediately upon leaving the pipe mill and prior to loading pipe into cars for destination.

Within the last several months after studying the results of Project NB-14 and further investigations by Transco's engineers, we have specified either amine or polyamid catalyzed epoxy resin paints. Our paint specifications approve paints manufactured by four different companies.

Coating costs . . . Costs for cleaning the pipe and applying an epoxy coating have varied considerably due to working space in the various pipe mills, methods of manufacture of pipe, location of pipe mills, rate of pipe-mill production, sizes of pipe, etc. However, a general rule of thumb for estimating cost of materials, application and handling has been to allow 1 cent per diameter inch per lineal foot, with smaller sizes of pipe running slightly higher. It is felt that these prices will probably be reduced if more internal coating is done by the industry.

An interesting development of the internal-coating applications has been the ability to obtain a pipe of better structural quality. In the past, mill and company inspectors have been able only to visually check a joint of pipe with a light on a dirty scale-covered inner surface. It is now proved that defects previously overlooked in the mill inspection are being spotted by the paint inspectors.

The characteristic that allows this to be done is the reflected light from the clean, glossy, freshly painted surface. Defects such as pits, slivers, and weld undercuts stand out prominently. Experience has been that approximately ½% of the production of several mills has developed defects, spotted during the painting process, which are beyond repairable tolerance of the API pipe codes. This is a benefit of the coating process which is extremely important, but difficult to associate with a fixed cost percentage in evaluating the true economic value of internal coating.

Another interesting fact which we observed was in cleaning and testing internally coated pipe. It was found that in running pigs, about half the pressure was required to move a pig through a coated line than would be required for an uncoated line. It was also found that when lines were hydrostatically tested it was possible to remove all of the water with considerably fewer number of pig runs. In many cases, it was possible to completely dry up a 36-in. line with as few as four pig runs.

If the experience of other companies who may try internal coating corroborates, it appears it will probably be a rule rather than an exception that gas-pipeline companies make internal coating a standard practice of their construction programs.

Acknowledgments

Thanks are given C. E. Schorre and S. J. Bellassai, of the Transcontinental engineering department. O. W. Wade, of Wade & Butterfield, who was connected with Transcontinental during the development period, also deserves special mention.

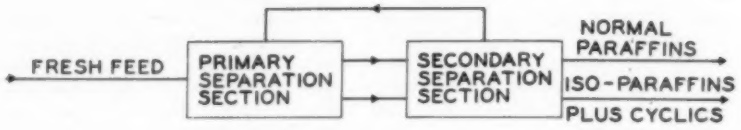
A. S. Crutcher, of Crutcher-Rolfs-Cummings, and his engineering staff have also contributed much to the development of techniques in cleaning and applying internal coating. The engineering and technical staff of Coast Paint & Lacquer Co., which manufactures Copon, one of the approved paints used by Transcontinental, gave much aid and assistance. The technical staff of Napko Paint Co. also contributed to the development.

The cooperation and assistance of these pipe manufacturers is gratefully acknowledged: Colorado Fuel & Iron Co., American Bridge Co., Bethlehem Steel Co., Republic Steel Corp., A. O. Smith Corp., Kaiser Steel Mills, and National Tube Division of U. S. Steel.

Industry gets two processes to upgrade gasoline by removing normal paraffins

1. MOLEX—A truly continuous process using molecular sieves

BY D. B. BROUGHTON AND D. B. CARSON
Universal Oil Products Co.



. . . It's UOP's newest octane booster

EVEN THE BEST gasolines marketed today contain appreciable quantities of normal paraffins—materials so inferior that they are used as the lower standard on the octane-performance scale. The Molex process provides the industry with a practical tool for the clean removal of these low-quality components.

The Molex process separates all of the normal paraffins as a group from the other types of hydrocarbons through the use of "molecular sieves." Although the affinity of such materials for normal paraffins has long been known, the practical problems inherent in the use of such adsorbents have prevented commercial application for hydrocarbon type separation.

The objectives in developing the Molex process were:

1. To develop a process which would remove normal paraffins throughout the gasoline boiling range in a single treatment.

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2. To develop a continuous process.
3. To develop such a process capable of clean separations using a minimum of utilities.

These objectives have been realized in the process shown schematically above. Basically the unit consists of a primary separation section and a secondary-separation section.

How it works . . . In the Molex process, the separation is carried out under conditions which are easily incorporated into normal refining operations. The adsorbent is used in a fixed-bed isothermal manner, and feed and separated product streams are uniform and continuous. Temperatures and pressures are moderate and ordinary materials of construction are satisfactory. The use of this new process thus permits refiners to easily and economically remove the objectionable normal paraffins from their gasoline products, and, by the use of other available processes, such as isomerization and catalytic reforming, convert them into desirable gasoline constituents.

There are occasions on which the process is not competitive with fractionation, other occasions on which it is very definitely superior to fractionation, and still other occasions on which it will perform a separation impossible by fractionation.

In a separation such as isobutane from normal butane, or isopentane from normal pentane, the choice between fractionation and Molex will depend upon factors such as concentration, capacity, and product purity. On more complex hydrocarbon mixtures, such as a pentane-hexane mixture, Molex presents pronounced technical and economic advantages.

Table 1 gives results which were

TABLE 1—PILOT-PLANT SEPARATIONS ON PENTANE-HEXANE STOCKS

	Stock A—Nat. gaso. hexanes			Stock B—Nat. gaso. $C_5 + C_6$			Stock C—light reformate		
	Feed	Denorm. product	Normal product	Feed	Denorm. product	Normal product	Feed	Denorm. product	Normal product
Analysis, wt. %									
nC_5	0.0	0.0	0.0	17.5	0.4	41.2	23.0	1.7	70.3
nC_6	39.1	0.7	99.2	25.3	0.6	57.6	8.5	0.3	25.9
Isoparaffins	51.8	84.4	0.7	51.5	88.2	1.1	54.0	78.1	1.7
Naphthenes	9.1	14.9	0.1	5.7	10.8	0.1	6.5	9.3	0.2
Aromatics	0.0	0.0	0.0	0.0	0.0	0.0	4.9	7.0	0.1
Olefins	0.0	0.0	0.0	0.0	0.0	0.0	3.1	3.6	1.8
Total n-paraffins, wt. %	39.1	0.7	99.2	42.8	1.0	98.8	31.5	2.0	96.2
Octane number									
F-1 clear	61.4	79.5	28.0	66.8	84.1	46.0	78.6	90.0	56.7
F-1 + 3 ml.	84.4	96.0	63.7	87.4	98.4	72.9	94.5	102.0	80.8
F-2 clear	59.4	80.4	25.3	. . .	83.6	41.9	76.0	85.9	53.3
F-2 + 3 ml.	85.3	97.4	65.3	. . .	101.2	75.1	95.1	101.2	. . .

TABLE 2—ECONOMIC COMPARISON OF FRACTIONATION WITH MOLEX-PENEX ISOMERIZATION OF 2,500 BBL. PER DAY OF MIXED PENTANES AND HEXANES TO 100.3 F-1 PLUS 3 ML.

	Penex with fractionation	Penex with Molex
Investment cost:		
Penex unit	$780,000	$650,000
Separation unit	900,000	855,000
Total	$1,680,000	$1,505,000
Operating cost:		
Labor and administration	$267	$267
Steam	640	240
Fuel	80	72
Cooling water	75	30
Power	80	63
Sieve replacement	....	150
Maintenance	145	130
Local taxes and insurance	121	108
Total	$1,412	$1,060
Yields:		
Isomerized product, bbl. per day	2,417	2,455
Fuel gas, 10^6 B.t.u. per day	573	298
Value of incremental yield, dollars per day:		
Isomerized product	....	239
Fuel gas	55	....

obtained in pilot-plant operation with three different mixtures of C_5 and C_6 hydrocarbons. These stocks are first, a mixture of C_6 paraffins; second, a mixture of C_5 and C_6 paraffins and, third, a light extract cut of reformate which has olefins and aromatics present in addition to the paraffins. In each case the pilot plant performed a very respectable separation, one that fractionation would be hard pressed to equal.

Economics

Qualitatively, in any separation of normal paraffins from other hydrocarbons Molex will consume less utilities than fractionation. For less-difficult separations, the installed cost of Molex will be higher. Another generality is that as increasingly precise separations are desired by fractionation, the investment and utilities requirements for a given capacity increase sharply. This is not true of Molex. Moreover, many separations are so complex that they cannot be accomplished with fractionation, but can be made readily with Molex.

Still another economic factor which must be considered in comparing Molex and fractionation for stocks of the type shown in Table 1 is the eventual destination of the normal pentane and normal hexane product. It is believed that these materials will find their principal outlet by isomerization to high-octane, low-sensitivity gasoline, employing processes such as Penex.

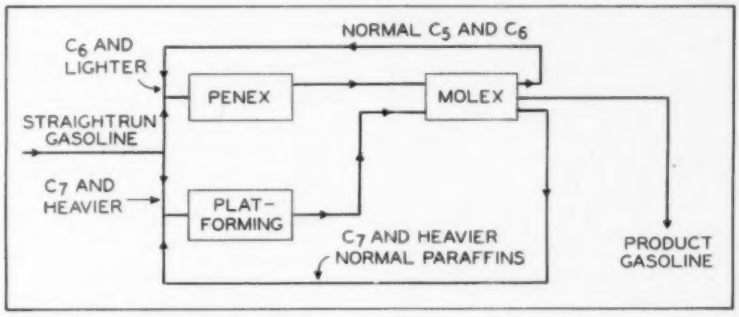
In this type of processing, when fractionation is used to separate the isomerized products from unconverted

"Molex is a tool for lowering the aromatic content of gasolines while maintaining high research octane number, thus lowering the sensitivity and the octane-requirement increase."

normal hexane, C_6 cyclics tend to remain with the recycle normal hexane. Consequently, the recycle builds up in cyclic content to the point where a considerably larger isomerization unit is required. This problem does not arise when Molex separation is used, since in this case cyclics remain with the isoparaffins. The savings in isomerization investment cost can be credited to the Molex investment.

C_5-C_6 separation . . . The economic comparison shown in Table 2 uses as a basis a pentane-hexane mixture of the type shown as Stock B in Table 1. Steam cost has been taken on the basis of $0.35 per 1,000 lb. The fresh-stock charge rate has been taken as 2,500 bbl. per day. By either route, Penex plus Molex, a total product having a leaded research octane number of 100.3 is made. The over-all yield is slightly better for the Penex-plus-Molex operation, resulting in a credit for this case.

Table 2 shows that the Penex-plus-



STRAIGHTRUN GASOLINE may be processed by a combination of catalytic reforming, isomerization, and Molex. Fig. 1.

TABLE 3—PILOT-PLANT SEPARATIONS ON GASOLINE BOILING-RANGE STOCKS

	Reformate stock D			Reformate stock E			Straightrun stock F		
	Feed	Denorm. product	Normal product	Feed	Denorm. product	Normal product	Feed	Denorm. product	Normal product
Vol. % aromatics	53	...	...	57	...	...	4	...	...
Wt. % n-paraffins:									
C_5	4.4	0.4	37.1	2.7	0.2	25.4	0.0	0.0	0.0
C_6	3.8	0.5	30.6	3.7	0.4	33.6	0.7	0.1	2.2
C_7	2.9	0.6	21.6	3.5	0.7	28.8	3.2	0.2	10.8
C_8	...	...	...	...	...	...	11.2	0.4	38.3
C_9	1.3	0.3	9.4	1.1	0.4	7.4	9.9	1.9	30.0
C_{10}+	...	...	...	...	...	...	3.9	0.8	11.7
Total n-paraffins, wt. %	12.4	1.8	98.7	11.0	1.7	95.2	28.9	3.4	93.0
F-1 clear O.N.	89.5	95.0	35.3	93.6	99.1	37.0	29.0	38.7	<0
F-1 + 3 ml. O.N.	98.2	101.3	65.3	101.2	104.9	65.2	53.8	65.7	10.3

Molex case not only represents an investment of $175,000 less than Penex plus fractionation, but in addition operates for $325 a day less and produces an additional $184 per day of product. In its pilot-plant experience, UOP has operated for extended periods on this type of stock with no significant deterioration in sieve activity. The replacement cost of sieves in Table 2 is believed to be a conservative extension of the operating life demonstrated in the pilot plant.

Upgrading reformate . . . All catalytic reformates contain C_5 through C_9 normal paraffins. Usually the amount of normal pentane plus normal hexane exceeds the sum of all the heavier normal paraffins. However, as the molecular weight of the normal paraffin increases, the octane number becomes rapidly worse so that the removal of the C_7 and heavier normal paraffins is important from a quality standpoint.

A separation of all normal paraffins from a reformate by fractionation is not practical; by Molex the separation is accomplished readily in one operation. This is shown by the pilot-plant results tabulated in Table 3. Also included in Table 3 are results of a Molex separation on the straightrun stock to demonstrate the ability of the process to handle heavier normal paraffin components in higher concentrations.

Molex can be used in conjunction with catalytic reforming in several ways. It is of interest to investigate whether the addition of a Molex unit to a catalytic reforming unit has attractive economics. Consider the case of a refiner whose catalytic reformer is operating at its maximum severity for the required capacity. This refiner could remove heavy normal paraffins from his reformate by the addition of Molex, thereby increasing its octane rating.

It is also assumed that this refiner is not yet in need of the ultimate octane attainable through the use of an integrated isomerization, reforming, and Molex operation. Therefore, only the heptane and heavier reformate is charged to the Molex and only the heptane and heavier normal paraffins are removed from the final reformate.

In evaluating the products from the Molex unit, gasoline price has been based on the 1958 edition of Platt's Oil Price Handbook, Gulf Coast low cargo price, and normal paraffins at light-fuel-oil price. Table 4 presents the economics of Molex in this situation.

As Table 4 demonstrates, this application of Molex pays out readily. In this application the pilot plant has operated for an extended period with insignificant decline in sieve activity. The sieve life assumed for this application is a conservative extension of demonstrated life.

Straightrun processing . . . Consider now the processing of a straightrun gasoline to its ultimate octane number. In this case catalytic reforming, isomerization, and Molex are employed as shown in Fig. 1.

The anticipated performance of this combination on a typical C_5 and heavier Mid-Continent straightrun gasoline is shown on Fig. 3 as a plot of liquid yield based on straightrun vs. leaded research octane number of the produced gasoline. A dashed line is shown to represent the performance of a system in which the C_7 and heavier portion of the straightrun stock is reformed and then blended with the virgin C_5 and C_6 material to give the gasoline product.

It can be seen from Fig. 2 that the flow scheme of Fig. 1 gives increasingly higher yields of gasoline than only reforming as octane goals are set higher.

Since the ultimate leaded octane number of the total gasoline (reformate) blended with the virgin C_5 and C_6 material) produced when reforming only is used is about 102, economic comparisons above this level, or even approaching it, are meaningless. The economics of the addition of Penex and Molex to a catalytic reformer have been evaluated on the basis of a fixed reforming severity.

Employing the processing arrangement of Fig. 1 on a typical Mid-Continent straightrun gasoline containing 10.4 liq. vol. % C_5 and 14.2 liq. vol. % C_6, the economic data shown in Table 5 have been developed.

In preparing Table 5, it has been presumed that the Penex and Molex facilities are to be added to a catalytic reformer capable of reaching 93 F-1 clear octane number. The addition of these facilities shows a very attractive payout.

Actually, this straightrun gasoline could be processed to higher final octane number if the reformer is operated at higher severity. Economics of such a case are necessarily vague because of the absence of quoted prices on gasoline at octanes above 102. At reformer severities below 93, the economics of Molex plus isomerization are still attractive; for instance, on this stock at 85 F-1 clear octane refor-

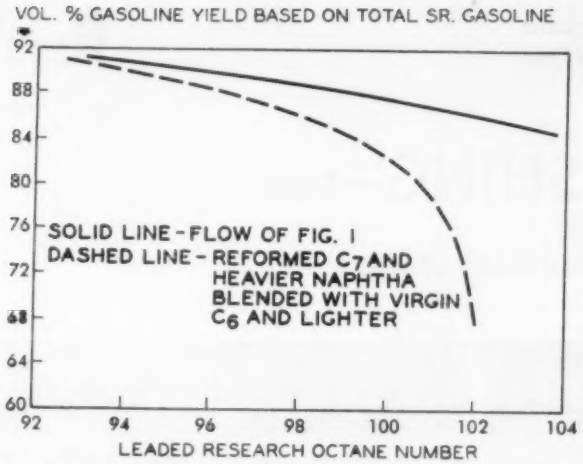
TABLE 4—MOLEX SEPARATION OF C_7+ NORMAL PARAFFINS FROM REFORMATE

	B/D	F-1 + 3 ml. Oct. No.	Value— Ct./gal.	Value— $/day
Charge	5,000	96.0	11.75	24,675
Denormal product	4,570	99.1	13.19	25,317
Normal product	430	...	9.63	1,739
Increase in value	...	...	...	2,381
Molex, installed cost	...	...	...	$800,000
Operating cost, $/day:				
Labor and administration	...	...	138	...
Steam	...	...	120	...
Fuel	...	...	15	...
Cooling water	...	...	26	...
Power	...	...	8	...
Sieve replacement	...	...	218	...
Maintenance	...	...	70	...
Local taxes and insurance	...	...	59	...
Total	...	...	654	...
Gross profit, $/day	...	...	1,727	...
Payout, before taxes and before royalty, years	...	...	...	1.27

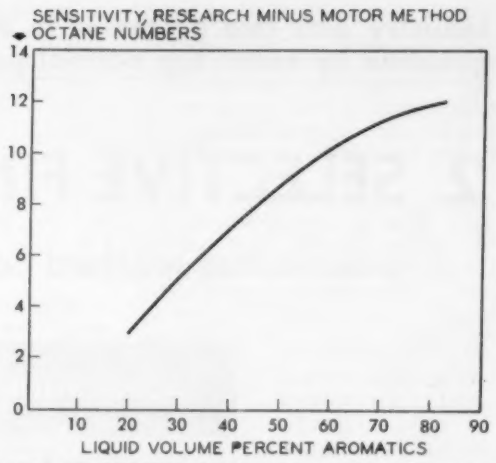
TABLE 5—ECONOMICS OF CATALYTIC REFORMING PLUS ISOMERIZATION PLUS MOLEX

Basis: Reforming Mid-Continent naphtha to 93 F-1 clear octane number, 10,000 bbl. per day of full-range straightrun gasoline..

	Reforming only	Reforming plus isomerization plus Molex
Product gasoline including light straightrun:		
F-1 + 3 ml. octane number	96.9	102.1
Bbl./day	8,776	8,580
Value, ct./gal.	12.10	15.56
Value, $/day	44,600	56,071
Incremental product value, $/day	...	11,471
Incremental operating cost, $/day	...	1,710
Gross profit, $/day	...	9,761
Incremental investment	...	$2,411,000
Payout on incremental investment before taxes and royalty, years	...	0.68



YIELDS OF GASOLINE using catalytic reforming alone and catalytic reforming with isomerization and Molex. Fig. 2.



LEADED SENSITIVITY of reformed gasolines increases rather sharply with increase in aromatics concentration. Fig. 3.

mate a payout time of 1½ years is indicated.

Normal paraffin uses . . . Substantial quantities of normal paraffins, heptane and heavier, can be made available as a byproduct of Molex treatment of reformates. This is an entirely new product from the industry, for which special uses may well develop. For example, these normal paraffins could be the starting point for synthesis of straight-chain organic compounds of various types, such as aldehydes and alcohols.

Certainly they would be a preferred stock for high-temperature pyrolysis to make ethylene, etc., since normal paraffins are easily cracked. Another unique property of normal paraffins is that they demonstrate the highest heat of combustion per pound of any hydrocarbon. This property should be of value in preparing fuels for aeronautical purposes—jet or missile fuels.

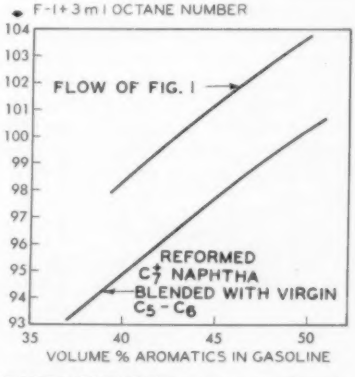
These normal paraffins can of course be recycled to the reformer, but it is predicted that, due to their specific chemical and physical properties, they will ultimately be of greater value in other applications.

Sensitivity lowered . . . The major product of any of the foregoing schemes applying Molex is gasoline. The gasolines so produced will have compositions different from gasolines as we know them today. The economic data which has been presented is based solely on research octane numbers, but the benefit to the refiner from Molex goes beyond research-octane-number economics.

Molex is a tool for lowering the aromatic content of gasolines while maintaining high research octane number, thus lowering the sensitivity and the octane-requirement increase. These are the other things which the ultimate consumer will notice in his automobile, in addition to the research octane number.

Fig. 3 shows how the sensitivity of a reformed gasoline varies with the aromatics content. This approximate relationship holds for reformed gasolines including C_5 and C_6 in varying amounts regardless of charge-stock source. Through the use of Molex the refiner is able to eliminate the worst paraffinic components from his product. For a given research octane number, he therefore requires a lower aromatic content since the average quality of the paraffins is improved. The lower aromatic content results in a lower sensitivity.

For the full range Mid-Continent naphtha assumed in the development of Table 5, the relationship between aromatics content and leaded research octane number is shown in Fig. 4. Curves are shown for the case of Platforming only and the case of Platforming plus Molex plus Penex. It is apparent from these curves that at a constant research octane rating a reduction of aromatics content of from 5 to 7%, depending on octane level, is accomplished by the use of Molex and Penex in conjunction with Platforming. Fig. 3 shows that this reduction in aromatics content results in lower sensitivity by approximately one full number.



LEADED RESEARCH octane number increases significantly as concentrations of aromatics increases. Fig. 4.

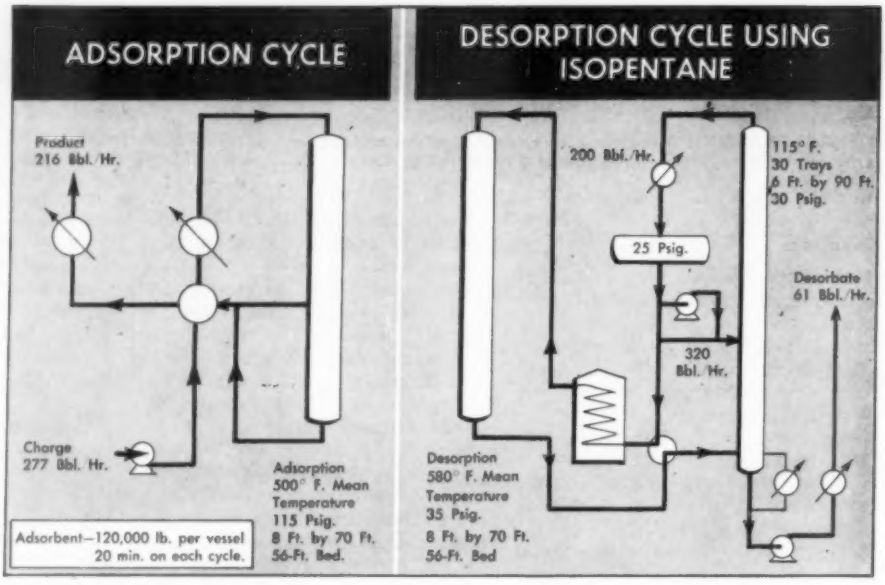
Ultimate product quality . . . In planning new facilities, a refiner is always interested in the ultimate quality of product the facilities can produce. The ultimate leaded research octane number which can be produced from the Mid-Continent naphtha when Platforming is the octane-upgrading process involved only is about 102; Platforming plus Molex and Penex produces at ultimate severity a gasoline of about 105 octane number. Fig. 4 shows that at any fixed Platforming severity, the addition of Penex and Molex facilities will give the refiner a potential increase of from 3 to 4 leaded research numbers on this Mid-Continent stock.

In conclusion, UOP now offers to the industry a process to accomplish separation of normal paraffins as a class from narrow cuts or from full-boiling-range gasolines. The process has been shown to be economic not only when in competition with fractionation but also when called on to perform separations impossible with fractionation. It enables the refiner to produce gasoline of lower sensitivity than he can now produce.

Alternately Molex enables the refiner to raise the research octane rating of his gasoline without increasing sensitivity. Extensive pilot-plant work, which developed the data presented here, has demonstrated the technical practicality of the process. This process is a major step forward in separation techniques.

Industry gets two processes to upgrade gasoline by removing normal paraffins

2. SELECTIVE FINISHING—Texaco process has reached commercial stage



. . . another molecular-sieve development

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TEXACO selective finishing (TSF) may be applied to a wide variety of stocks, so that it is a versatile process usable in many situations. The prime consideration in selecting a stock to be treated is that it contain low-octane-number straight-chain components. Selective finishing will upgrade in octane number such diversified stocks as catalytic reformate, light straightrun naphtha, heavy FCC naphtha, or even a heavy straight-run naphtha.

TSF may be used to treat a catalytic reformate either to produce a higher-octane-number product at any given severity level, thereby raising the reformer octane ceiling, or to reduce the reformer severity required to produce a given octane-number product, with the consequent increase in catalyst life. The process may also be applied to light stocks where higher front end octane number is desired. Selective finishing is well adapted to use in conjunction with paraffin isomerization for removal of unconverted normal paraffins.

Unlike many other processes utilized for octane number improvement, selective finishing does not necessarily improve octane number by increasing aromatic concentration. This point becomes increasingly important as greater emphasis is placed on fuel sensitivity. The previously reported work[1] which evaluated the blending characteristics and road performance of selectivity-finished light naphthas, showed that an appreciated type of blending was obtained with finished light straightrun naphtha and finished light reformate.

This positive blending deviation means that a small but significant octane credit could be obtained by use of finished light naphthas in a premium-gasoline blend. For maximum road octane performance, isoparaffinic fuels may be blended using finished light naphthas to produce gasolines having 101-102 and higher (+3 cc TEL) research octane number.

The TSF process is a nondestructive process. The total quantity of liquid charge is recovered, separated into two streams of low and high octane number 2, 3, and 4. The low-octane-number components are separated and recovered for use in other products or recycle to the conversion process.

The Process

The essential part of the TSF process is the sorbent used a selective adsorbent. The selective adsorbent is a synthetic ziolite material whose unit cell has the form of a modified cube. Removal of the water of hydration leaves a void space within the unit cell, with access to the center gained through openings of fixed dimensions 5, 6, 7.

In the particular version of TSF to be described, the operation is cyclic using fixed beds of selective adsorbent. During the first part of the cycle, charge stock is passed over a bed of selective adsorbent until the void spaces in the crystal structure become filled with straight-chain molecules.

When the bed of selective adsorbent becomes saturated with straight-chain material, no further sorption can take place. At this point the straight-chain molecules will pass through the bed without being picked up by the adsorbent and begin to appear in the effluent product. Charge to the bed is then stopped and the second part of the cycle, desorption, is started.

Removal of the material contained in the pores may be best accomplished by sweeping the bed with some vapor phase desorption medium. Light-hy-

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TABLE 1—RESPONSE OF VARIOUS STOCKS TO TEXACO SELECTIVE FINISHING

Stock	Research octane numbers — Charge to TSF — Clear	Charge to TSF — +3 cc TEL	Finished product — Clear	Finished product — +3 cc TEL	RON increase (clear)
Light straightrun naphtha	69.0	87.1	83.7	96.6	14.7
Heavy straightrun naphtha	44.1	66.4	70.6	...	26.5
Full-boiling-range platformate A	87.1	97.1	95.3	101.1	8.2
Full-boiling-range platformate B	94.0	100.8	98.1	104.0	4.1
Thermal cracked naphtha	76.0	88.5	89.1	96.1	13.1
Heavy FCC naphtha	88.0	94.0	94.4	98.8	6.4
Light FCC naphtha	93.8	99.2	95.7	100.6	1.9
Aviation alkylate	93.1	104.4	93.6	...	0.5
Propylene polymer gasoline	93.0	98.0	93.6	98.6	0.6

drocarbon vapors or fixed gases have been found to be suitable. The cycle is then repeated when all of the sorbed straight-chain material has been removed.

Process results . . . Since the TSF process operates by removing the low-octane-number straight-chain hydrocarbons, the octane-number improvement obtained in treating any stock will depend on the concentration of straight-chain components (and also upon the composition of the remaining hydrocarbons). The data shown in Table 1 illustrate the response to TSF which might be expected of some typical refinery stocks. Leaded and clear research octane numbers are shown for each of the stocks before and after selective finishing. The last column shows the increase in clear octane number obtained by selective finishing.

Of the stocks shown, the straight-run naphthas respond best to finishing, with a 14.7 and 26.5 clear octane-number improvement for light and heavy straightrun naphtha respectively. The finished light-straightrun naphtha leads to 96.6 research octane number. The good response of these two stocks might be anticipated from the knowledge that they contain considerable quantities of normal paraffins.

The response of two full-boiling-range catalytic reformates is shown next. These two stocks differ in octane number, the first having 87.1 while the second has 94.0 clear research octane number prior to selective finishing. The difference in octane, which reflects a difference in composition, causes the finishing response to be reduced from 8.2 to 4.1 clear octane numbers. The higher-octane number reformate, which contains fewer normal paraffins, shows less clear octane-number increase. However, the leaded octane numbers of both finished reformates are well above 100.

The next stock listed, thermal cracked naphtha, might also be expected to contain a considerable proportion of straight-chain components. The response obtained, 13.1 numbers, approaches that of light straightrun naphtha. The catalytically cracked naphthas, which would be expected to contain fewer straight-chain hydrocarbons, show less response, although considerable improvement is obtained with heavy FCC naphtha.

In general, stocks will respond to TSF in proportion to their straight-chain isomer content. This point is effectively illustrated by the data shown in Table 1 for platformate B and aviation alkylate. The clear octane numbers of these two stocks are quite similar, 94.0 and 93.1. However, the reformate shows a 4.1 number response while the alkylate shows essentially no response, since the half number shown lies within the reproducibility of the octane-number determination. The polymer gasoline shows a response similar to that of the alkylate.

n-Paraffin variation . . . In addition to finding that the best octane response is obtained with stocks containing the highest percentage of normal paraffins, it was found that different boiling-range portions of a stock vary in their normal paraffin content, and hence in their response. Catalytic reformate is a typical case in question.

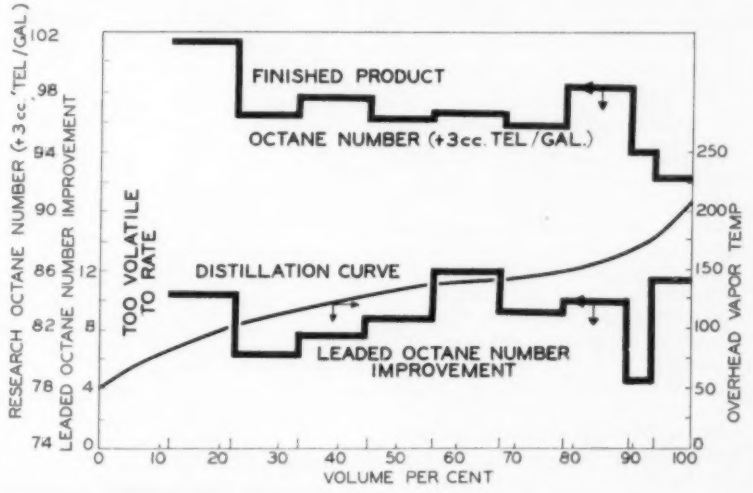
A sample of 87.0 clear research-octane-number reformate was fractionated into 10 approximately equal fractions. Each of the 10 fractions obtained from this stock were then subjected to selective finishing, using vapor-phase fixed-bed contacting. The octane number of the product from treating each of the 10 fractions was determined. The results are plotted in Fig. 1.

The curve shows the vapor temperature of the column overhead as a function of the volume per cent distilled. The lower series of stepped lines represents the difference in leaded research octane number between the charge and finished product for each of the 10% cuts. The upper stepped lines show the leaded-octane-number of each of the 10% fractions after selective finishing.

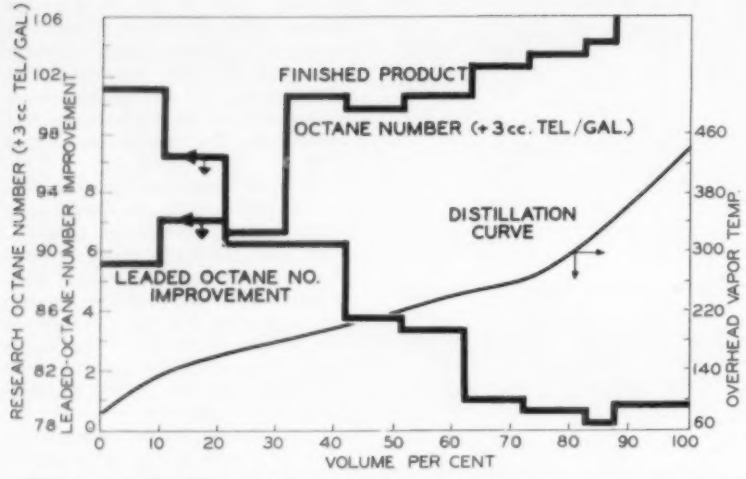
The greatest octane number response is shown by the front end of the reformate, with a 4 to 7-octane-number improvement. The bottom end, which is largely aromatic, shows little improvement. Above 250° F. overhead vapor temperature, less than 1.0 octane-number improvement could be obtained. However, the bottom end is already high in octane number and improvement here is not necessary. It is the low-octane-number front end which requires the greatest improvement and it is on these fractions that the greatest improvement is realized.

Since the separation of catalytic reformate into light and heavy fractions is practiced in many instances, treatment of only the light stream, boiling below 250° F., would reduce the feed to the selective-finishing unit by almost 40% while maintaining essentially the same degree of upgrading of the over-all stock.

Straightrun evaluation . . . A similar evaluation of 10% fractions of a light



FINISHING RESPONSE of reformate fractions shows advisability of splitting reformate before treating. Fig. 1.



FINISHING RESPONSE of light straightrun naphtha fractions shows that total stream can be profitably treated. Fig. 2.

straightrun naphtha was also made.

TSF data on the 10% fractions are plotted in Fig. 2. Here again, the curve shows overhead vapor temperature while the lower and upper stepped lines show leaded-octane-number improvement and leaded octane number, respectively, of the finished products.

Response of the light straightrun naphtha differs from that of the catalytic reformate both in magnitude and uniformity. Octane-number improvements ranging from 4.7 to 12 numbers were obtained over the entire boiling range of the stock, in contrast to the relatively poor octane-number response shown by the heavy reformate,

Octane numbers of the finished fractions of the light straightrun naphtha range from 92.2 to 101.5. While there are several possible ways to upgrade material in the light straightrun-naphtha boiling range, some of which involve separation into fractions, TSF offers promise of upgrading the entire stock in a single operation.

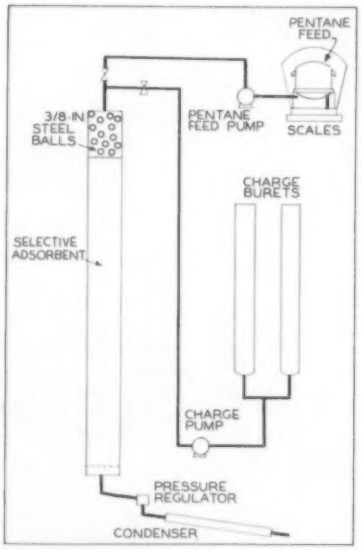
Operating Cycle Evaluation

A process cycle has been evaluated for a selective-finishing operation charging a light stock, in this case taken to be a mixed hexanes stream similar to that which might be obtained from platinum catalyst. The data obtained show the feasibility of separating hexane isomers and demonstrate the operability of the TSF process.

A charge stock containing 26.3 wt. % normal hexane and 73.7 wt. % isohexanes was processed in a single-bed pilot unit. The equipment, shown schematically in Fig. 3, consisted basically of an electrically heated cylindrical vessel equipped with a pressure regulator and an outlet condenser. Two pumps with necessary connecting lines and valves were employed, one for charging the mixed hexanes and another for charging the pentane desorption medium.

The finishing-agent bed was enclosed in a 1.5-in. i.d. stainless-steel tube 70 in. long provided with an axial thermowell. The top 5 in. of the tubular vessel was packed with ⅜-in. steel balls and was used as a preheat section. Below the preheat section the bed of selective adsorbent extended for a depth of 65 in. and contained 1,280 g. of adsorbent having a volume of 1,700 cc.

A pressure regulator was located on the discharge line from the vessel.



PILOT-PLANT EVALUATION was made of a mixed hexane charge stock. Results showed flexibility of the process.

A condenser consisting of a brine-cooled, jacketed tube was connected to the discharge side of the pressure regulator.

Cycle conditions . . . A balanced vapor-phase, isothermal, pressure-swing operating cycle at 600° F. was used in these experimental runs. Mixed hexanes were charged downflow to the bed at a rate of 1.0 liq. vol. per hour per volume of adsorbent. The charge flow was stopped at a point where the bed was just short of saturation. The bed was then depressured to atmospheric pressure. Desorption was accomplished by charging pentane downflow to the bed at a rate of 0.75 liq. vol. per hour per volume of adsorbent.

In the complete operating cycle mixed hexanes were charged to the bed for a 15-minute period, then the bed was depressured and desorption was accomplished in a 15 minute interval. The process was operated with a balanced cycle of approximately 30 minutes' duration. Throughput of charge stock for these conditions was 0.5 vol. per hour per volume of selective adsorbent.

Yields . . . Outlet streams concentration and yield data obtained in 24 consecutive cycles are shown in Table 2. The isohexane product stream, the material collected in depressuring and the normal hexane desorbate stream of every fourth cycle, were analyzed by gas chromatography. Yields and compositions of all streams were calculated on a pentane-free basis. A composite blend which contained corresponding samples from each cycle was also prepared and analyzed.

These data show the degree of separation and yield attainable with the Texaco Selective Finishing Process. Work carried out with different charge stocks demonstrated that continuous operation could be carried beyond 2,000 cycles. The operation has also been carried out in a 10 BPD pilot unit.

The composite sample of isohexane product over the 24 cycles had a purity of 98.5% and the desorbate contained 94.7% normal hexane. The material collected in depressuring contained substantial amounts of both iso and normal hexane. This stream could be recycled to either the finished unit or the isomerization unit if it were desired to obtain only relatively pure product and desorption streams from the process. In certain situations it might not be necessary to obtain a high-purity product, and the depressure and products streams could possibly be combined.

In these runs with a stock contain-

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Manufacturer "A" (NEMA C)	Low	2-3%	No	No	No
Manufacturer "B" (NEMA D)	Med.	5-8%	Yes	No	Yes
Manufacturer "C" (NEMA D)	Med.	5-8%	No	No	No

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GENERAL ELECTRIC

TABLE 2—COMPOSITION AND YIELDS OF TEXACO SELECTIVE FINISHING PROCESS STREAMS

Cycle		Normal hexane (wt. %)	Isohexanes (wt. %)	Yield (wt. %)
4	Product stream	1.2	98.7	66.2
	Depressure stream	42.4	57.6	8.0
	Desorption stream	94.8	5.2	21.6
8	Product stream	1.6	98.3	66.2
	Depressure stream	35.8	64.1	10.1
	Desorption stream	93.6	7.3	21.7
12	Product stream	1.8	98.3	68.6
	Depressure stream	36.5	63.4	10.7
	Desorption stream	93.6	6.3	20.8
16	Product stream	1.7	98.2	69.2
	Depressure stream	38.9	61.2	8.2
	Desorption stream	93.4	6.5	23.2
20	Product stream	2.0	97.9	64.4
	Depressure stream	37.4	62.6	10.8
	Desorption stream	94.5	5.7	18.5
24	Product stream	1.7	98.2	65.6
	Depressure stream	31.6	68.6	13.1
	Desorption stream	93.4	6.8	22.2
Composite Sample	Product stream	1.4	98.5	67.0
	Depressure stream	31.6	68.3	10.3
	Desorption stream	94.7	5.3	21.2

ing 26.3% normal hexane, a product yield of 67.0% represents 90% of the maximum possible product yield. The 10.3% yield of material with a high normal paraffin content obtained in depressuring could be recycled to the selective finishing unit resulting in complete separation into product and desorbate streams. If this were done, the throughput would be reduced from 0.5 to 0.44 vol. per hour per volume of adsorbent.

Economic Considerations

Cost data were calculated for the selective finishing cycle on hexanes separation. A two bed system was used, and the balanced pressure swing cycle was employed.

During the sorption period, fresh charge is exchanged against the vessel effluent, then further heated to 325° F. before charging to the bed of selective adsorbent. Additional heating is accomplished within the bed by the liberation of the heat of sorption of the normal hexane contained in the charge stock.

Although the heats of sorption and desorption were not large enough to cause any significant departure from isothermal operation in the pilot unit of the preceding section, the effect may be large enough to increase the bed temperature significantly during sorption in a larger commercial unit.

However, in adiabatic operations, heat generated within the bed would tend to compensate for natural heat losses and help maintain vapor-phase operation. The heat balance of the cycle can be regulated by varying the temperature of the hexanes charge and the pentane desorption medium.

Sorption operations . . . At the start of sorption, the vessel is at desorption pressure, 20 psig. Charge stock is pumped into the vessel with no product withdrawal until the sorption operating pressure is reached, here chosen to be 100 psig. This pressure is then maintained by the withdrawal of normal hexane-free product, until the desired degree of bed saturation is obtained. A sorption period of 20 minutes was assumed. At the conclusion of this period, charge to the first vessel is switched to a second vessel which has just completed its desorption period.

The actual desorption period is preceeded by a depressure period of short duration, wherein the pressure is reduced from the 100-psig. sorption pressure to 20-psig. desorption pressure. Then desorption medium, in this case isopentane, is pumped over the bed until all of the sorbed normal hexane is removed. The total elapsed time for the depressure plus desorption periods was taken to be equal to the 20 minute sorption period.

The desorption medium is heated to 800° F. to supply the required heat of desorption and to obtain some slight temperature rise in the bed. After exchange with incoming fresh desorption medium, the effluent is stripped to recover normal paraffins and isopentane for recycle. Although the desorption medium shown is isopentane, other light hydrocarbons which could be easily stripped, such as normal pentane, isobutane, or normal butane, could be used.

Cost data . . . Estimated cost data calculated on the basis of the cycle described are shown in Table 3. A total processing cost of $0.273 per bbl. is shown for an assumed 6,660 bbl. per calendar day plant size. Of this figure, $0.047 per bbl. are fixed charges. Included in these fixed charges is a depreciation allowance on the estimated investment of $1,900,000. Charges for labor plus materials and supplies amount to $0.047 per bbl.

This leaves some $0.179 per bbl. operating expenses. A large fraction of the operating expenses is the chemicals charge, which is the cost of 120,000 lb. of selective adsorbent charged to each processing vessel. In arriving at a figure for this cost, a price of $1.00 per lb. was used, to give a total chemicals charge of $240,000. This calculates to $0.099 per bbl. on the assumption of a 1-year adsorbent life, which is felt to be a conservative estimate.

Any reduction in cost or increase in life would result in a lower total operating cost for the TSF process.

Gasoline-pool improvement . . . In order to obtain a more meaningful figure, the cost of the improvement to the entire gasoline pool, in terms of dollars per octane gallon, which might be obtained by installation of TSF was estimated. To approximate a

TABLE 3—Estimated Cost Calculations for Texaco Selective Finishing 6,660 bbl. per Calendar Day Mixed Hexanes Charge

Estimated expenses	Unit amount ($/bbl.)
Labor plus materials and supplies	$0.047
Utilities	0.080
Chemicals	0.099
Total operating	0.179
Total fixed charges	0.047
Total (ex indirect and general overhead)	0.273

TABLE 4—ESTIMATE PROCESSING COSTS FOR TEXACO SELECTIVE FINISHING

Charges	Amount	
Motor-gasoline Loss due isomerization	$ 761	
Expenses-TSF and incremental isomerization	2,409	
Total charges	3,170	
Credits—TEL saved and Byproducts	423	
Differences (Charges—credits)	2,747	
Cost of increasing octane number	Pot octane No.	
	before TSF	after TSF
	97.5	98.324
Motor-gasoline pot	$32,880	

$$\text{Cost per research octane-gallon} = \frac{2747}{32{,}880 \times 42 \times 0.0824} = \$0.00241$$

realistic situation under such conditions, it was postulated that the selective-finishing unit be operated in conjunction with high-temperature hexane isomerization, such as platinum-catalyst isomerization.

The cycle shown in the flow diagram, which is the one on which the cost data are based, assumed 22% normal hexane in the hexane isomerate. The normal hexane desorbate could then be recycled to the isomerization reactor. The improvement to the total gasoline pool which could be realized by blending the higher-octane-number finished product was calculated and the cost data applied to determine the cost per octane gallon. A summary of these calculations is shown in Table 4.

The $761 charge shown for motor-gasoline loss represents the yield penalty incurred in the isomerization step, since selective finishing is essentially a no-loss operation. The unit cost, $0.273 per barrel, used in calculating the charge for the selective finishing operation is based on the $1.00 per lb. cost for the selective adsorbent. Any reduction in price or increase in life for the selective adsorbent would reduce this cost. Added to this selective-finishing cost is the incremental isomerization cost due to the additional isomerization processing necessitated by the recycle stream.

Blending the 216 bbl. per hour of isohexanes product into an assumed 32,880-bbl. per calendar day gasoline pot increases its octane number by better than 0.8 research octane number. The cost of this increase calculates out to be $0.00241 per octane gallon. This cost compares favorably with other gasoline processes on a research-octane basis. In addition, fuels containing finished stocks show improved road-octane performance which is difficult to take into account in arriving at a dollar comparison with any other process.

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An engineer looks at . . .

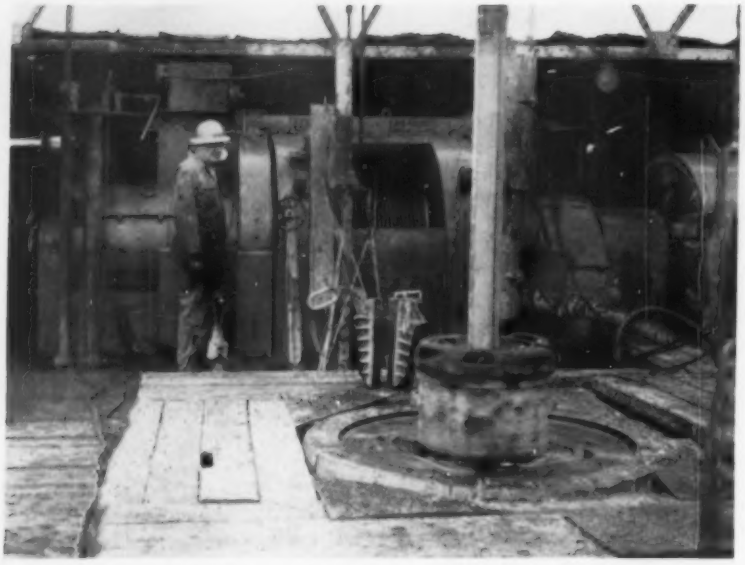
Steam drilling rigs

Low depreciation, economical repair and maintenance, and simplicity have kept many steam rigs competitive in spite of their higher moving and fuel expense.

By E. D. ARNOLD
Falcon Seaboard Drilling Co., Houston

SINCE THE END of World War II, the number of active steam rigs has continuously decreased until now the only large concentration of them in the United States is along the Gulf Coast.

On the Gulf Coast there is an ample supply of gas available from many transmission lines, gathering lines, and wells. Moreover, there is generally an abundant supply of water that requires only moderate treatment. And, here, steam rigs have continued to



DRAW WORKS on Falcon Seaboard Rig 2. Driven by a 14 by 14-in. steam engine, this draw works in low gear is rated to pull 284,300-lb. hook load at 86 ft. per minute on 10 lines strung.

operate competitively with the large power rigs.

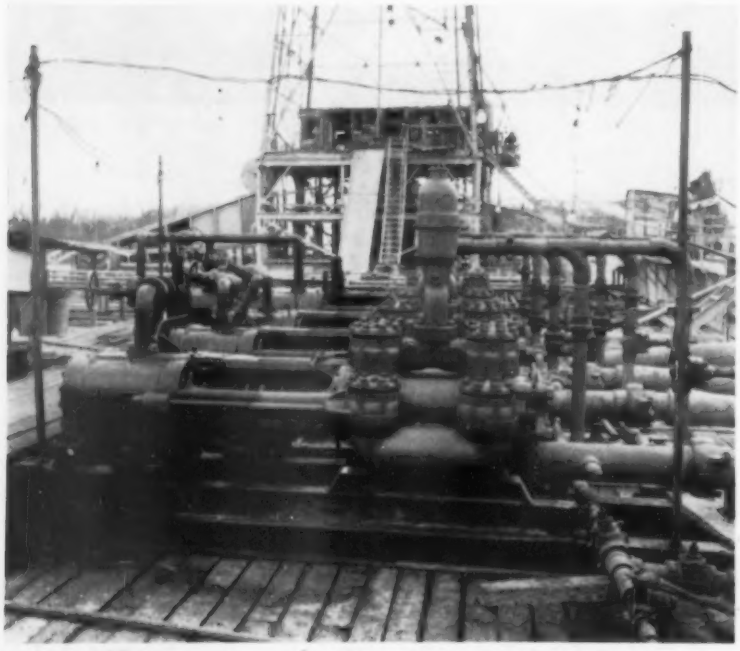
This article examines the reasons that these steam rigs have remained competitive in price and performance with more modern power equipment.

Fuel and water problem . . . During World War II, there was great development of high-horsepower internal-combustion engines. During the same period there was little development of steam equipment. At the end of the war the internal-combustion-engine manufacturers searched for a market for their products. They found the drilling industry receptive, especially in areas where water was not readily available in large quantities or where the water required excess treatment for boiler use. The same was true in areas where fuel, especially gas, was expensive.

Even on the Gulf Coast where water and gas are plentiful, steam rigs have been relegated to deep drilling. Medium-depth drilling is now dominated by power rigs because moving and rigup expense of the smaller power rigs is much less than the heavy steam rigs.

However, on deep drilling, moving expense of heavy power rigs is about the same as that of heavy steam rigs. Here the steam rigs continue to hold their own despite the advantage heavy power rigs enjoy on rigup time.

Fuel cost is a distinct advantage for power rigs. Thermal efficiency of oilfield boilers is very low. Consequently, much of the heating value of the gas consumed in firing boilers is not converted into useful steam horsepower. Fuel cost for steam rigs is approximately twice that for large power rigs using diesel engines, and compared with power rigs using gas engines the fuel cost for steam rigs is more than twice as much. With such a great differential in fuel cost and reduced rigup time for power rigs, there are necessarily other factors favoring steam rigs. Otherwise, they could not remain competitive with heavy power rigs.



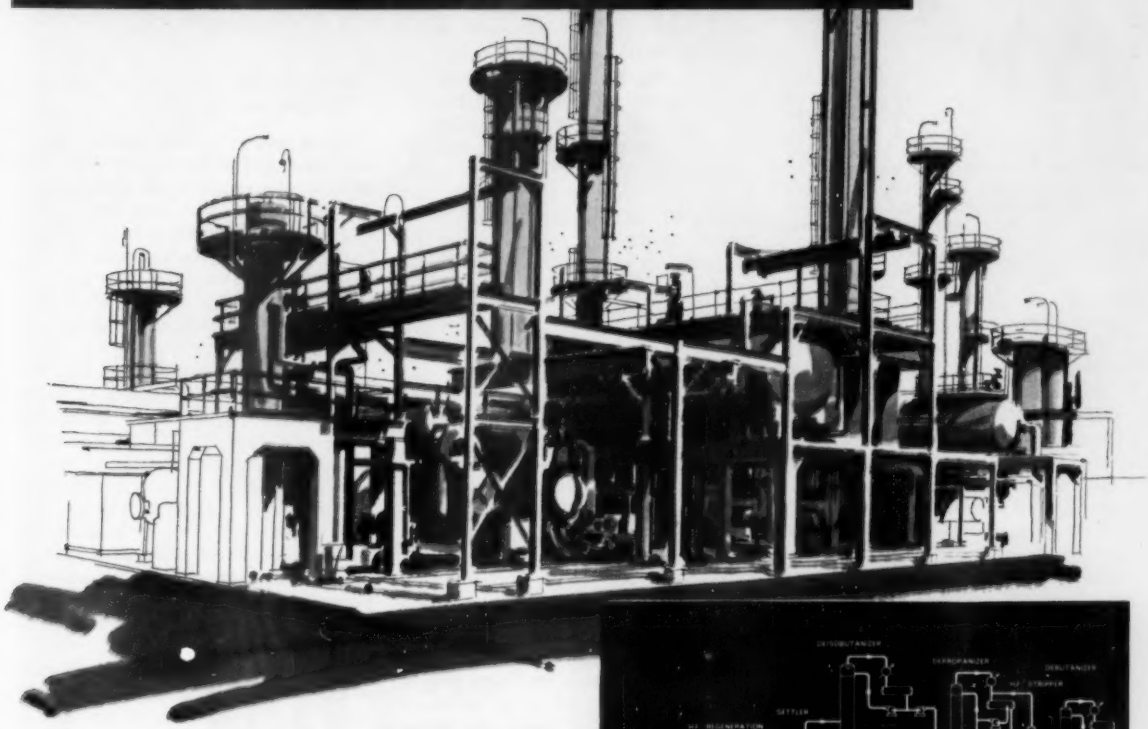
STEAM PUMPS such as these can drill a well from surface to below 15,000 ft. without changing liner size. Yet the hydraulic program is good all the way.

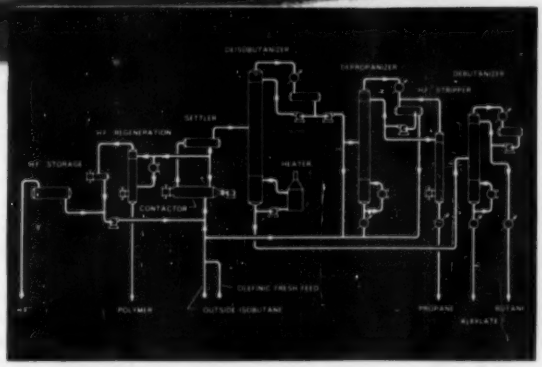
Points in favor . . . These are the factors which make operation of steam rigs economical: depreciation of equipment; repair and maintenance; and simplicity of equipment. Depreciation is a flexible and controversial factor that is not apportioned uniformly by owners of drilling rigs. Generally, however, because of its age, steam-equipment depreciation is confined to major overhauls and replacement. Replacement is nearly always used or surplus equipment purchased at a much lower cost than new.

In a great many cases the heavy power rigs are comparatively new. And they are presently being assessed depreciation on initial investment as well as major overhauls and replacements. In Falcon Seaboard's operations the depreciation differential amounts to approximately $100 per day less for steam rigs than for heavy power rigs.

Repairs and maintenance account for approximately $50 per day in favor of steam rigs. This difference results from the smaller number of moving parts in steam-rig equipment than in power-rig equipment. With cheaper repairs and maintenance, it follows that the time lost to repair steam-rig equipment is less than for power-rig equipment. Lost time is doubly costly because labor is unpro-

HF Alkylation





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"HF" Alkylation is a catalytic process which combines olefins such as propylene, butylenes and amylenes with isoparaffin (usually isobutane) to form a mixture of branched chain hydrocarbons of higher molecular weight known as alkylate. "HF" Alkylation is also widely used for producing high octane aviation gasoline.

Motor alkylate, an isoparaffin fuel component, burns with a minimum of carbon deposits even in today's modern high compression automobile engines and thus greatly reduces surface ignition and its consequent "rumble."

Another method for producing alkylate is also available to refiners through UOP. It is similar to the "HF" method but uses sulfuric acid as the catalyst. This process is licensed by Universal Oil Products Company under their own patent rights and the patent rights of Shell Oil Company, The Texas Company, The British Petroleum Company, Limited and Standard Oil Company of New Jersey.

These processes for producing alkylate afford further evidence of UOP's policy of providing the refining industry with every means for a well-rounded, profitable manufacturing operation.

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More Than Forty Years Of Leadership In Petroleum Refining Technology

THE AUTHOR

E. D. Arnold is drilling engineer with Falcon Seaboard Drilling Co., Houston, which operates six steam rigs along the Gulf Coast and two in Venezuela. Prior to this, from 1952 to 1957, he worked for Mene Grande Oil Co. in Venezuela as a drilling engineer. During that time, Mene Grande operated 20 to 25 steam rigs. Arnold graduated from Texas A. & M. College in 1949 with a degree in mechanical engineering. Following graduation, he worked for Hutchison Manufacturing Co. as an engineer until his association with Mene Grande.

ductive during repairs, and hole not drilled during repairs is lost.

Simplicity of equipment is a big advantage of steam rigs. Repairs can be made to steam-rig equipment by rig-crew personnel more frequently than to power-rig equipment. This, of course, results in double savings to steam-rig operators. Expense for specially trained personnel is a minimum, and no time is lost while waiting for specially trained repair personnel to arrive at location before repairs can be started.

On the Gulf Coast one out of every seven of all rotary drilling rigs is steam powered, and in the heavy-class rigs one out of every three rigs is steam powered. Consequently there is no problem in securing experienced steam-rig personnel.

How they perform . . . Economy is a prime concern in rig operations. Thus, performance of equipment must be considered. People not thoroughly familiar with steam rigs tend to believe that steam rigs are slower in making trips with drill pipe than are power rigs. And, some think that steam rigs don't have adequate pump horsepower. Neither of these opinions is well founded in Gulf Coast drilling.

As an example, Falcon Seaboard's steam draw works, in low gear, with a 14 by 14-in. steam-engine drive, are rated at 86 ft. per minute hook speed and 284,300 lb. hook load with 10 lines strung. Comparable power rigs with 1,000 to 1,100 total engine horsepower are rated at 86-85 ft. per minute hook speed and 273,000-314,000 lb. hook load with 10 lines strung and in low-high gear. These ratings are generally adequate for drilling to 12,000-13,000 ft. with 4½-in. drill pipe.

Power draw works can be operated in low-intermediate or low-low gear, providing slower hook speed for heavier hook loads. Steam draw works cannot be reduced below low gear. But because of the nature of steam engines the hook speed decreases as the hook load increases. As a result, steam performance compares with the power draw works in the lower gears.

Power rigs in excess of 1,100 hp. will, of course, produce higher hook speeds than will the steam draw works at depths below 12,000-13,000 ft.

Rarely is higher hook speed of larger power rigs of any particular advantage in drilling below 12,000-13,000 ft. on the Gulf Coast. Reason is that in many cases, protective casing is set at or above that depth and drilling continued with increased mud weights which impose practical limits on speed of pulling drill pipe below those depths because of hazards of swabbing the hole, etc. Also, drilling below protective casing is quite frequently done with drill pipe smaller than 4½ in. When drill pipe size is reduced, it extends the depth to which the rated hook speed can be maintained before reaching hook-load capacity.

Drilling reports from wells drilled by Falcon Seaboard indicate that there is very little, if any, difference in trip time from 12,000 ft. on steam rigs and power rigs in the 1,000 to 1,100-hp. class.

What about pumps? . . . Many consider pump capacity the most important single factor of a rig for Gulf Coast drilling. Most heavy rigs, steam or power, found on the Gulf Coast have pumps rated at 600 hp. or greater. The amount of horsepower available is of no consequence unless the horsepower is used to advantage. It is possible to deliver more energy to the bit with a 650-hp. pump at a comparatively low rate of flow and the horsepower correctly utilized than with a 1,000-hp. pump at a high rate of flow and the horsepower misused.

Consider a well-engineered hydraulic program for jet-bit drilling in 8⅝-in. or larger hole with 4½-in. drill pipe. The greatest loss of unproductive energy nearly always occurs within the bore of the drill pipe and drill collars. This energy loss expressed in terms of pressure loss through 1,000 ft. of bore and as derived in Hughes Tool Co.'s "Hydraulics in Rotary Drilling, Bulletin 1-B" is:

$$P = \frac{0.58\ G^{1.58}}{D^{4.86}}$$

Where:

P = pressure loss through i.d., psi. per 1,000 ft.
G = circulation rate, g.p.m.
D = bore diameter, in.

Assuming:

Mud weight = 9.5 lb. per gal.
Mud viscosity = 3 cp.

For a given bore diameter the pressure loss varies directly as the circulating rate raised to the 1.58 power. Annular losses also increase as the rate of flow increases, but to a much lesser degree than the losses within the bore. Consequently, as the rate of flow increases and the hole depth increases, the less productive energy is available at the bit.

Power rigs are engineered for the pumps to stroke at a constant rate in accordance with the engine speed and horsepower. Maximum discharge pressures for various liner sizes are computed on the basis of horsepower input at rated pump speed with 100% volumetric efficiency and 85% mechanical efficiency. Maximum discharge pressure then becomes a function of pump speed.

Most power pumps in the 850-1,000-hp. class have either a 16 or 18-in. stroke and are rated at 60, 65, or 70 s.p.m. at maximum horsepower input. With 7-in. liners in the pumps, the rated displacement for this class of pumps would vary from 575 to 775 g.p.m.

From this, an 850-hp. input pump with a displacement of 575 g.p.m. would have a maximum discharge pressure of 2,153 psi. with 7-in. liners. A 1,000-hp. input pump with a displacement of 775 g.p.m. would have a maximum discharge pressure of 1,880 psi. with 7-in. liners.

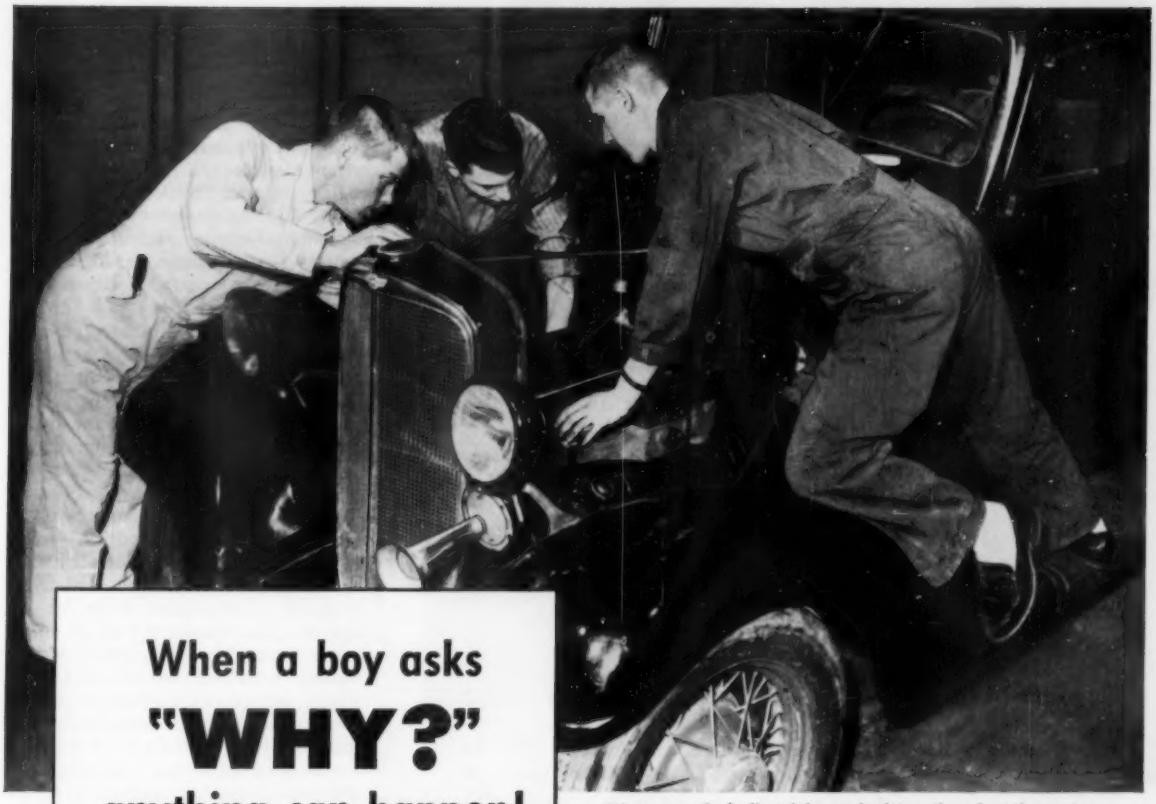
Therefore, except for annular velocity, an 850-hp. pump could conceivably provide a much better hydraulic program than a 1,000-hp. pump with the same size liners. The higher maximum discharge pressure and the lower rate of flow place more energy at the bit.

Liner changes . . . High rate of flow is an advantage for top-hole drilling. The high annular velocity is desirable

TABLE 1—TYPICAL PERFORMANCE OF 19 BY 7¾ BY 22-IN. STEAM PUMP

Depth	G.p.m.	Mud. wt.	Nozzles (in.)	Energy used at bit— H.hp.	Per cent
5,000	490	9.8	3⅜	333	80.4
6,700	405	9.8	3⅜	318	76.5
9,100	395	10.3	3⅜	310	74.6
10,000	375	11.9	3⅜	307	73.9
11,000	350	12.5	3⅜	262	63.1
11,500	350	12.5	3⅜	262	63.1
12,000	340	12.5	3⅜	240	57.8

The story of Standard Oil's contributions to oil progress through research is told to the public in advertisements like this during the year.

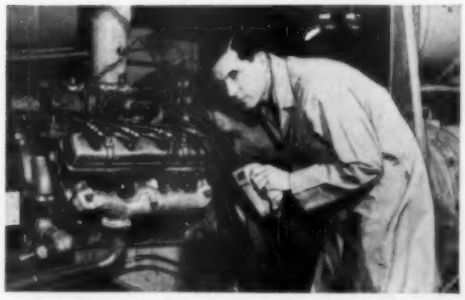


When a boy asks "WHY?" ...anything can happen!

This scene can be duplicated thousands of times throughout the country. And as long as it goes on, America can be sure of continued progress. Here Bob Hansen (left) and two friends explore the mechanical wonders of an engine (1933 model). The two other boys are Tony Riccardi (center) and Bill Hess. They are all students at Niles Township High School, Skokie, Illinois.

Ever since Bob Hansen was old enough to hold a wrench, he has been tinkering with machines. Next year his repair shop on his driveway at home will disappear because Bob, an honor student, is going to college to study engineering.

Bob is one of thousands of American boys with a restless curiosity about things mechanical. What makes a clock tick? What makes a bicycle brake hold? What makes a car run? From such curiosity comes the mechanical progress that has helped to make America great.



The efficiency of gasoline and lubricants is improved constantly in Standard Oil's huge automotive laboratory in Whiting, Indiana. Here fuels are designed, too, for automobiles that will not be on the street until five years from now. Robert W. Boydston, above, is working on a "fuels of the future" experiment.

In Standard Oil's big automotive laboratory in the research center at Whiting, Indiana, engineers are going through a similar process every day—asking questions and finding answers. How do fuel additives affect combustion? How do they affect engine deposits? How do burning rates differ?

And the questions continue outdoors, too. In all kinds of weather—hot, cold, wet, dry, low barometer, high barometer—different blends of gasoline are tried to see what happens under what conditions. Fuels are designed in the laboratories for experimental engines that won't appear in an automobile for five years. Standard Oil products are under constant improvement to give the finest performance possible. You get years-ahead quality with Standard Oil products—and at a reasonable cost.

Where does progress start? Does it start on the private driveway of a boy's home or in a huge research laboratory? Progress starts whenever someone asks "Why?" and sets out to find an answer.

What makes a company a good citizen?

Perhaps even more than an individual, a company must have a healthy respect for the future. Many companies, like Standard Oil, have large families—tens of thousands of people who depend on Standard for their livelihood. Progress through research is one way of protecting the future of both employees and investors and of helping to assure economic stability for the communities in which they live and work.

STANDARD OIL COMPANY
(INDIANA)

STANDARD
THE SIGN OF PROGRESS... THROUGH RESEARCH

Congrats and $25 to Billy D. Brown, T.P. Coal & Oil Co., P. O. Box 4067, Midland, Texas

Since the petroleum industry made its lusty entrance with the Drake well a century ago..some remarkable records of achievement have been chalked up by oil and gas men.

Lone Star Steel represents one of the great forward steps, and a real convenience for Joe Roughneck . . because Lone Star fine API pipe is made and delivered daily in the heart of the oil country.

Lone Star is a round-the-clock quality operation. You can depend upon Lone Star API casing, tubing and line pipe.

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to carry out cuttings during fast drilling. Along with this high rate of flow, there are excessively high frictional losses in the annulus and bore. So, at any appreciable well depth, there is only a small percentage of energy remaining for work at the bottom of the hole.

To reduce the rate of flow, it is necessary to reduce either pump speed or liner size. If pump speed is reduced without changing gear ratio between engines and pump, then the engines operate below rated horsepower and the pump operates below maximum discharge pressure and rate of flow. Consequently, the logical solution is to reduce liner size as well depth increases.

It is not uncommon to change liner size several times in the course of drilling a well from surface to 15,000 ft. with a power pump. Changing liners is time consuming, therefore, a costly operation. Moreover, it requires stocking various sizes of liners and pistons on the rig.

The simplicity of steam pumps is such that wells can be drilled from surface to below 15,000 ft. without changing liner size. Yet, the hydraulic program is very good from top to bottom. The horsepower of a steam pump is directly dependent upon the supply of steam, quality of steam, stroke, and cross-sectional area of the steam pistons. All of these factors remain relatively constant. So it becomes a matter of selecting a liner size that will provide good hydraulics for jet-bit drilling.

Performance on the well . . . Most of the larger steam pumps found in service are 18 by 8 by 20-in., or 19 by 7¾ by 22-in. Falcon Seaboard's experience has been that 7-in. liners are the best suited in these pumps for Gulf Coast drilling. These pumps run at approximately 55 s.p.m. on top-hole drilling. Based on 90% volumetric efficiency and a loss of 2 in. on the pump stroke the rate of flow varies from 555 to 620 g.p.m. This is quite adequate for top-hole drilling.

The steam pump more or less corrects itself for a good hydraulic program. As well depth increases, pump speed decreases and pressure increases. This reduced speed reduces rate of flow which, in turn, reduces the frictional losses per 1,000 ft. both in the pipe bore and annulus. At the same time there is no abrupt change in energy consumed at the bit.

Typical performance of 19 by 7¾ by 22-in. steam pump is shown in Table 1.

With 350-psi. steam pressure, theoretical stalling point for this pump is 2,570 - psi. discharge pressure. At

12,000 ft. under the above conditions the discharge pressure was 2,000 psi.

At approximately 13,000 ft., the point is reached where only 50% of the hydraulic horsepower is consumed at the bit. Then, the No. 2 steam pump can be compounded into the No. 1 pump and good hydraulics maintained to depths below 15,000 ft.

Recently, while drilling an 8⅜-in. hole at 15,000 ft., a 16½ by 8 by 20-in. pump was compounded into a 15½ by 15½ by 8 by 20-in. quad steam-end pump which had 7-in. liners. The pump was displacing 235 g.p.m. through 4½-in. drill pipe and 3⅞-in. jets. Surface pressure was 2,750 psi. and mud weight was 15.2 lb. per gal. Of the 377 surface hydraulic horsepower, approximately 200, or 53%, was consumed at the bit.

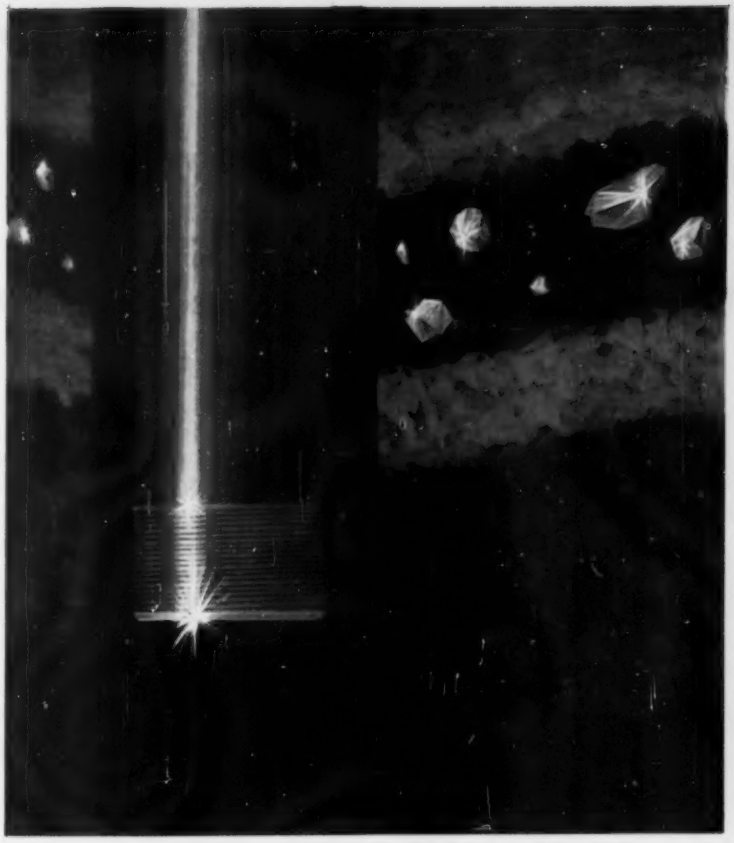
Maximum working pressure for the pump is 3,000 psi.; therefore, the well could have been drilled deeper before reaching the depth where only 50% of the hydraulic horsepower would have been consumed at the bit.

This 50% consumption of hydraulic horsepower at the bit is the minimum desirable. This does not imply that jet-bit drilling cannot be done with less than that amount.

To equal the performance of these large steam pumps, a power pump would require from 850 to 1,000-hp. input. Some larger power pumps, with minimum liner size, are capable of developing higher surface hydraulic horsepower than the large steam pumps. However, this horsepower differential results, in part, from greater displacement. Because of this greater displacement of power pumps, all frictional losses are higher. It is quite possible that all the horsepower differential, or more, is consumed in additional friction losses other than hydraulic horsepower consumed at the bit.

Other steam-rig savings . . . With steam equipment there are three types of power available — steam, hydraulic, and mechanical. With power rigs, only mechanical and hydraulic power are available. Availability of steam power often represents a sizable savings to the operator when mud tanks are jetted. Steam jets are not detrimental to the mud nor wasteful of mud.

Power rigs, of course, must use a fluid to jet the tanks. Usually the ratio is approximately 30% of the fluid used for jetting and 70% of the fluid being jetted. Very often power rigs use good mud for jetting tanks. At present prices for drilling muds this jetting of tanks can become costly. If water is used for jetting there results a certain amount of diluted mud.



GEM
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OIL AND GAS
INDUSTRY

To business, industry, the nation's defense and people in general . . oil and gas are more precious than diamonds.

The strong demand for petroleum products means a strong demand for casing, tubing and line pipe . . fine, skillfully crafted pipe as produced by Lone Star Steel. Lone Star pipe is a true quality product . . precision made to high API specifications.

Certainly . . the gem of the oil and gas industry.

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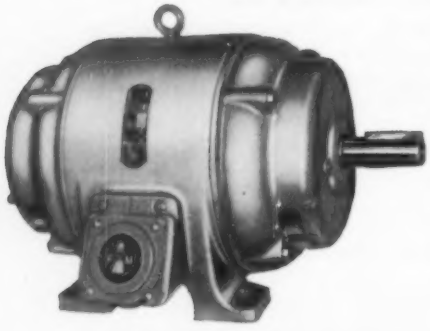
Low-cost jackpower starts with quality!

Fairbanks-Morse "ZC" Engines

The most dependable, most thoroughly proven engine available today for pumping service. The rugged, simple Fairbanks-Morse "ZC" is known the world over for its rock-bottom economy—its ease of starting in coldest weather—its efficiency on both gas and gasoline, with full-power switch-over to either. Clutch and sheave mount on either end of crankshaft for maximum adaptability. Six "ZC" sizes range from 3 to 30 horsepower.

Fairbanks-Morse Guarded Dripproof Motors



A completely guarded squirrel-cage induction motor with exclusive design for oil field service. Heavy-duty protected frame prevents entry of dripping liquids, flying chips or falling particles. Available with high torque, normal starting current—high slip, high starting torque—or general purpose normal torque. Ratings from ½ to 40 hp., 3600 to 600 rpm.

See your local supply store or write Fairbanks, Morse & Co., Oil Field Division, 1713 N. Market St., Dallas 2, Texas. Ask for new F-M Oil Field Equipment Bulletin.

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DIESEL, DUAL FUEL AND GASOLINE ENGINES • ELECTRIC MOTORS • PUMPS • COMPRESSORS
GENERATORS • SCALES • MAGNETOS • HOME WATER SYSTEMS

BOOKS

PETROLEUM-PREHISTORIC TO PETROCHEMICALS. By G. A. Purdy. Published by McGraw-Hill Book Co., Inc., 330 West Forty-second Street, New York 36. $15.00. 500 pp.

The author has been with Imperial Oil Co., Ltd., for the past 20 years as consulting engineer, research chemist, and technical information specialist. This book is written largely from the viewpoint of oil in Canada using Canadian examples throughout. Within this framework it does an excellent job of covering for the general reader the oil industry in all divisions. The book is written in a basic manner for the public and is a valuable adjunct for an information committee in need of a text explaining the industry to the public at large or to young students. It is accurate, up-to-date, and also useful in describing one segment of the industry to a specialist in another division.

ENCYCLOPEDIA OF CHEMISTRY (SUPPLEMENT). Edited by George L. Clark and G. G. Hawley. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22. 330 pp. $10.

The Supplement adds over 200 articles of primary and current importance to the "Encyclopedia of Chemistry." This will be the only volume added to the work.

The arrangement of the Supplement is identical to that of the parent book: articles appear alphabetically by subject. Each article is written by a respected authority in science and/or industry.

The book is aimed at those who seek to understand current scientific events by referring to such topics as antidotes, porphyrins, barbiturates, plasma, chemical education, propellants, cermets, dosimetry, fluoridation, resonance, jet propulsion, nylon, liquid state, and scores of others.

FUNDAMENTALS OF HIGH POLYMERS By O. A. Battista. Published by Reinhold Publishing Co., 430 Park Ave., New York. 140 pp. Price $5.50.

Here is a basic text introducing the reader to the imporant areas of a complex and fascinating field. The book begins with definitions—what does "high polymer" mean?, what is the meaning of "ISOTACTIC"?

With the meaning of basic terms cleared up, the author then goes on to the chemistry of high polymers including here condensation high polymers, both the polyamide or nylon types and the polyester or "Dacron" types, also stereoregular high polymers—developments of Ziegler and Natta.

Other subjects covered are the building blocks of high polymers—macromolecules to crystallites, architecture and geometry of macromolecules—followed by macromolecules in solution, the solid state of high polymers, and the physical properties of high polymers.

ORGANIC SYNTHESES, Vol. 38. By John C. Sheehan. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 120 pp. $4.

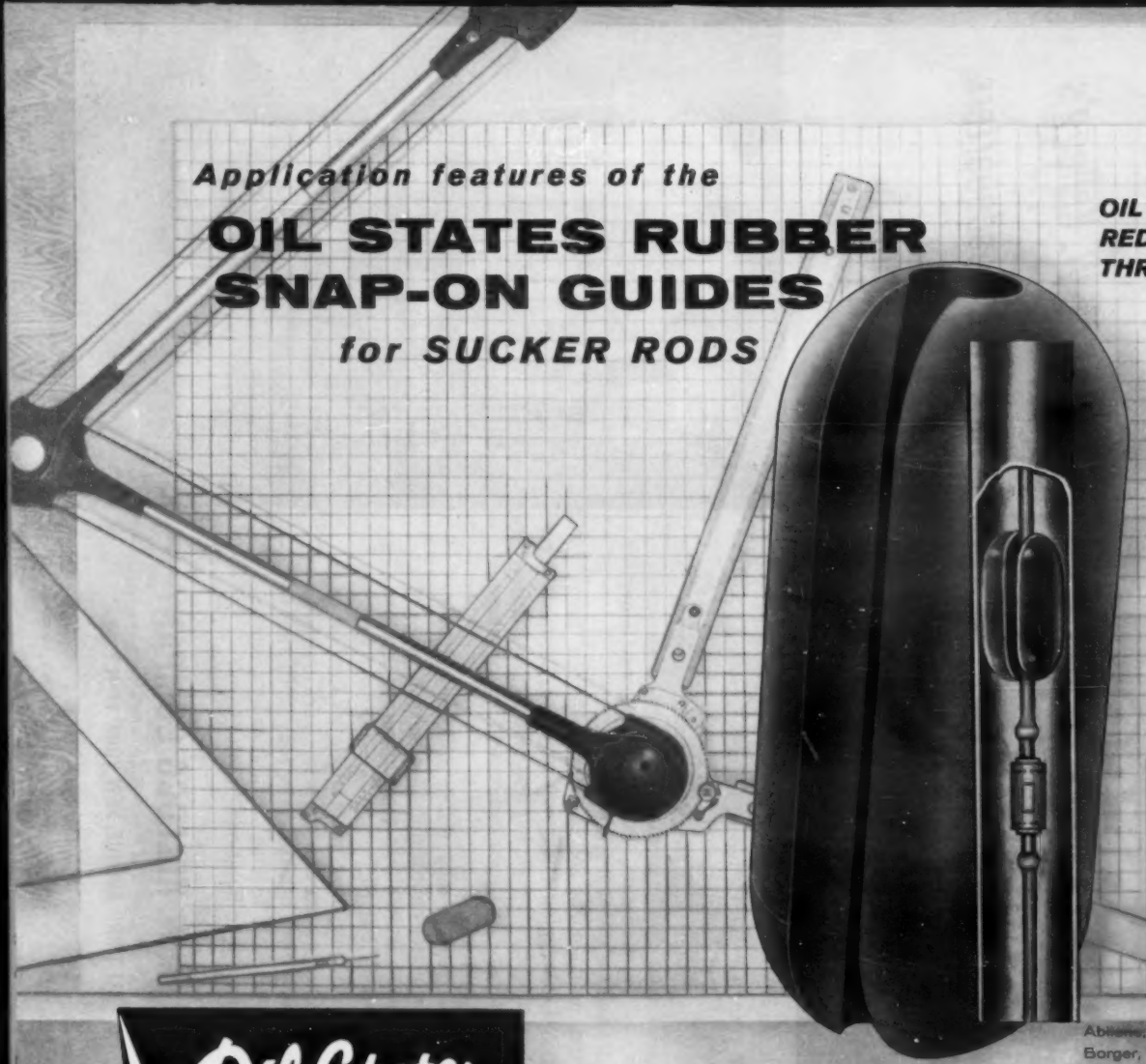
This collection of syntheses procedures for some 31 organic compounds is a continuation of the work reported in the first 37 volumes of the series.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Application features of the

OIL STATES RUBBER SNAP-ON GUIDES

for SUCKER RODS



OIL STATES RUBBER SNAP-ON GUIDES REDUCE OPERATING COSTS THROUGH THESE APPLICATIONS--

- Used in crooked holes or directionally drilled wells, to minimize wear on rods and tubing.
- Prevention of metal-to-metal contact in *any* well, giving low-friction bearing surfaces, with less power needed to lift the same amount of fluid.
- Lessens wear on the pump, by installing several SNAP-ON GUIDES just above the pump to deaden rod whip.
- Installed closely spaced in paraffin deposit zones, so that the SNAP-ON GUIDES will overlap on the stroke length, preventing paraffin deposit build-up.
- To prevent wear on rods in wells with low polish rod loads on the downstroke, as when "plunger" pumps are used, by eliminating rod bending inside the tubing.

Sold Through Supply Stores Only

THE OIL STATES RUBBER SNAP-ON SUCKER ROD GUIDE
Patent No. 2,604,364

Contact your local OIL STATES Field Representative for analysis and recommendations for your particular well requirements. It costs you nothing for this professional analysis and it may save you thousands of dollars in rod replacements and service costs.

Oil States

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Borger, Texas
Corpus Christi, Texas
Houston, Texas
Kilgore, Texas
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Wichita Falls, Texas
Casper, Wyoming
Denver, Colorado
Farmington, New Mexico
Great Bend, Kansas
Oklahoma City, Oklahoma
In Canada: Edmonton, Alberta
West Coast Distributor: Monarch Engineering Co., Gardena, California

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KELLOGG WELCOMES YOU

WORLD PETROLEUM CONGRESS and EXPOSITION

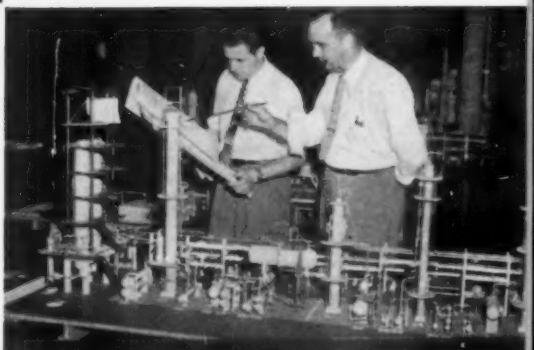
... and cordially invites you to see two of its advanced engineering and design techniques in actual operation— both at the New York Coliseum, June 1-5, and at M. W. Kellogg's New York headquarters, May 25—June 5...

WHEN IN NEW YORK for the Congress, refiners interested in advanced engineering and design techniques should plan to see the practical demonstrations of Kellogg's computer-programming and model-building developments. Both can be seen at Kellogg's exhibit at the Coliseum, Booth 510 (second floor, center aisle) or at Kellogg's New York offices.

At the Coliseum, a Burroughs 205 Computer will run three Kellogg programs: (1) Designing a heat exchanger; (2) Computing material balances around a complete gas recovery system; and (3) Calculating streams for the cascade reactor of a Kellogg sulfuric acid alkylation unit.

Also at Booth 510, visitors may watch designers building scale models, see how model photographs are used in place of drawings, and become acquainted with the many ways in which models improve and speed designs.

Refiners wishing to pursue these two techniques further, or to learn about other Kellogg engineering practices, are invited to visit the company's New York headquarters, May 25 to June 5. Arrangements can be made at Kellogg's exhibit or by telephoning Mr. A. L. Dowling, Public Relations, at OX 7-5200.



See scale models being built

See electronic computers at work

THE M. W. KELLOGG COMPANY

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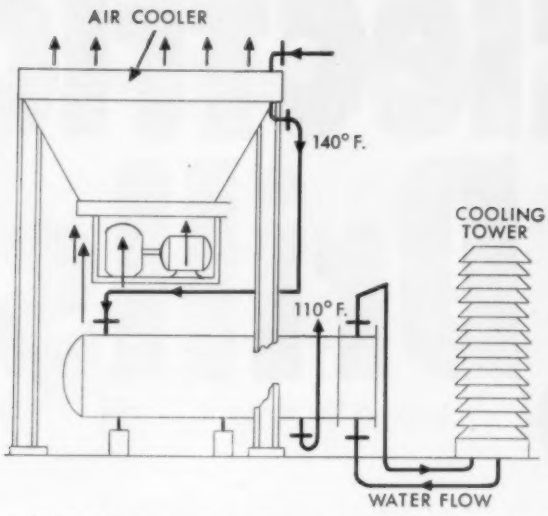
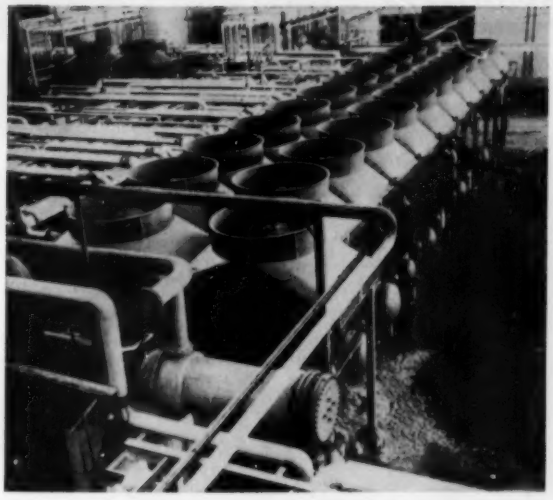


TRIM COOLER is frequently used to effect final heat removal when bulk of heat transfer is by air cooling.



SPACE BELOW AIR COOLERS can be utilized effectively. Photo courtesy of Hudson Engineering Corp.

Air cooling saves for Sohio

...even though fresh water is in plentiful supply

AIR COOLING is more economical than conventional water cooling for many applications, even in locations where fresh water is plentiful.

Studies for a 60,000-bbl. per day refinery in the Toledo area and for an expansion in Sohio's Lima, Ohio, refinery have shown that a considerable savings could be realized by using air cooling extensively. As a result of these studies, 20% of the cooling and condensing required in the new facility at Toledo is being done with air.

In addition, the principal condenser in a cat cracker revamp at Sohio's Lima refinery is an air cooler.

How it's done . . . When an air-cooling system is compared with a conventional water-cooling system, it is frequently necessary to use a small water cooler ("trim cooler") to effect the final bit of heat removal. Such a system is shown in the sketch.

In a typical case, the hydrocarbon stream might be cooled to 110° F. With air cooling, it is not possible to approach much closer to ambient temperature than 25° F. Thus, a trim cooler would be necessary to cool the stream below 120° F.

A condensation of a paper by J. W. Thomas, Standard Oil Co. (Ohio). Paper was presented at annual meeting, American Institute of Chemical Engineers, Cincinnati.

Actually, air cooling to such a low temperature may not be the economical approach. Sohio studies show the capital cost of the air-cooling system is usually lowest when air is used to cool to 140° F., and a trim cooler is used to cool from 140° down to the required outlet temperature. (Basis of these studies is a 95° F. ambient air temperature and a 75° F. wet-bulb temperature for the cooling-tower design.)

Photographs show an air-cooler system, utilizing a trim cooler, mounted above grade, and how space below air coolers can be utilized.

Cat Cracker Revamp

The revamp of the cat cracker at Lima required the addition of one large condenser. Since the existing cooling-tower capacity was already being taxed to the limit, the use of a shell-and-tube unit would have required the addition of another cell to one of the large cooling towers.

Capital costs . . . The fractionator overhead condenser had these process specifications:

Duty—33,000,000 B.t.u. per hour.
Temperature (in)—250° F.
Temperature (out)—120° F.

For the air-cooler case, a trim cooler was selected for cooling the

TABLE 1—SUMMARY OF CAPITAL COST

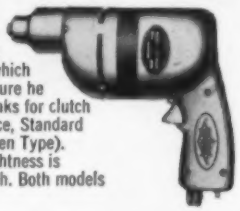
Air Cooling	
Air cooler	$73,000
Fireproofing, foundation, and erection	7,450
Process piping	2,260
Electrical installation	12,700
Trim coolers	6,625
(a) Water piping, (b) process piping, (c) foundation and erection	3,435
(d) Cooling-tower charge for 75 g.p.m.	2,600
Total	$108,070
Water Cooling	
Water condenser (3 shells)	$45,000
Water piping:	
(a) Above grade	2,502
(b) Below grade	8,300
Process piping	2,876
Foundation and erection	3,640
Cooling-tower expansion for 2,200 g.p.m.:	
(a) Tower	35,820
(b) Piping	7,800
(c) Pumps and motors	6,180
(d) Basin, pump and header pit	8,200
(e) Electrical installation	11,000
Capital cost for makeup water	8,800
Total	$140,118

CERTIFIED SIOUX POWER

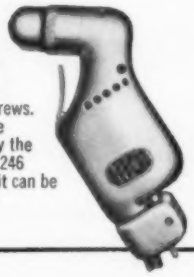
Electric Drills

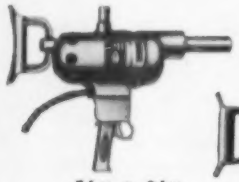
SIOUX ELECTRIC SCREWDRIVERS

NO. 260 — 262
On No. 260 Super Screwdriver the operator controls the tightness with which a screw is set by the amount of pressure he applies. The ¼" Hex Drive takes shanks for clutch head screwdriver bits, Reed and Prince, Standard screws, Phillips, and socket head (Allen Type). On the No. 262 Super Screwdriver tightness is pre-determined by adjusting the clutch. Both models equipped with reversing switch.



NO. 242
It fits the hand, and operates in restricted space like no other electric screwdriver. It quickly drives or removes all types of screws. No. 242 has a positive clutch; the operator controls the tightness by the amount of pressure applied. No. 246 has an adjustable clutch, so that it can be preset for any uniform degree of tightness desired.



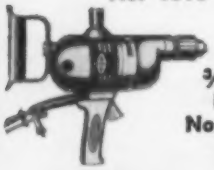


1" H.D. DRILL
No. 1579

⅜" & ¾"
H.D. DRILLS
No. 1560, 1575

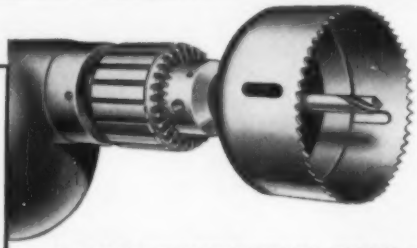
½" H.D. DRILL
No. 1550

½" STD.
DUTY DRILL
No. 1510



⅜" & 5/16"
H.D. DRILL
No. 1517, 1519

½" SLOW SPEED
DRILL No. 1548



SIOUX HIGH-SPEED STEEL TEETH HOLE SAWS

will cut holes from ⅝" to 6" in diameter, in any free machining material to a depth of 1⅛". Alloy or stainless steel may be cut at slow speed. High-Speed teeth welded to chrome-vanadium body give maximum life and cutting ability.

POWER* SPECIFICATIONS SIOUX ELECTRIC DRILLS

When it's a SIOUX you know what it will do

Catalog Number	No Load Speed	H.P. and R.P.M. at Load Speed		Oz. Ft. Torque at Load Speed	H.P. and R.P.M. at Peak Load Speed		Oz. Ft. Torque Peak Load
1475	2250	5/64	1525	4.9	7/64	1050	8.8
1480	1600	7/64	1140	7.9	5/32	790	16.8
1485	1650	3/32	1060	6.9	1/8	620	16.7
1495	1650	3/32	1060	6.9	1/8	620	16.7
1498	400	3/16	275	45.0	9/32	215	108.0
1510	525	27/64	370	95.0	39/64	230	222.0
1517	925	13/32	670	49.0	9/16	540	135.0
1519	1250	13/32	860	37.5	9/16	500	96.0
1525	1650	5/16	1060	31.0	3/8	680	45.0
1541	925	13/32	670	49.0	9/16	540	85.0
1548	525	27/64	370	95.0	39/64	230	222.0
1550	525	7/16	325	108.0	17/32	175	252.0
1560	400	9/16	260	175.0	3/4	155	400.0
1575	400	3/4	205	308.0	1-1/8	125	748.0
1579	350	49/64	200	315.0	1-9/64	115	800.0
1472	1600	13/64	960	17.8	17/64	720	32.4
1473	950	13/64	575	31.6	17/64	430	55.0
1474	625	13/64	375	44.6	17/64	280	84.2
1477	950	13/64	575	31.6	17/64	430	55.0
1478	625	13/64	375	44.6	17/64	280	84.2
1479	1600	13/64	960	17.8	17/64	720	32.4

*for complete specifications

SEE THE NEW SIOUX CATALOG

when it's a SIOUX

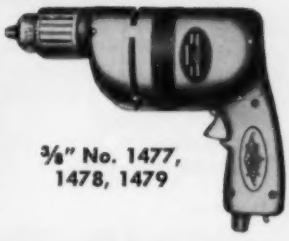
You know what it will do!

The Horsepower and torque for each SIOUX drill is rated, stated, and certified. It isn't necessary to buy just a drill. When it's a SIOUX you know what it will do. See the power specifications for SIOUX Electric Drills in this advertisement.

NEW *Super Powered* **¼" and ⅜" DRILLS!**

Here is super power to provide all the torque necessary for any operation where this type of drill would normally be used. (See specifications) And there's a speed for every need. It's an entirely new design in which the brushes have been located at the fan position at front of the drill. The advantages include cooler running, and easier inspection and replacement of motor brushes without partial or complete disassembly of the tool. Ball and roller bearing construction, with finest precision gears and mechanical design have achieved a new high in output efficiency.

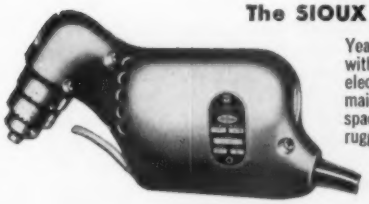
¼" No. 1472, 1473,1474



⅜" No. 1477, 1478, 1479

All time sales champ

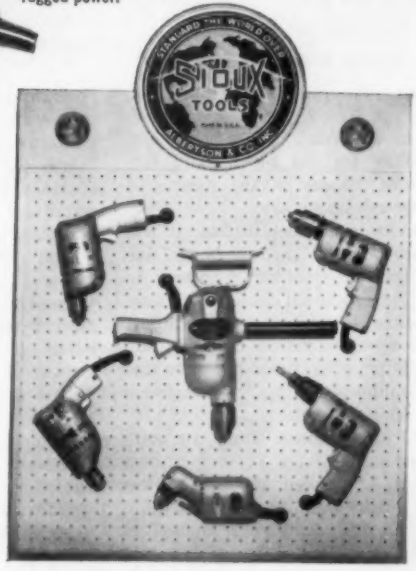
The SIOUX No. 1495 ¼" ALL ANGLE DRILL



Year after year this is a top seller in the SIOUX line. It's popular with almost everyone—auto mechanic, sheet metal worker, electrician, shipbuilder, woodworker, assembly line, factory maintenance man. It fits the hand and operates in restricted space like no other tool. It's a most convenient handful of rugged power.

Leading distributors everywhere display and sell Certified **SIOUX** *power drills.*

AUTHORIZED SERVICE AND DISTRIBUTORS IN PRINCIPAL CITIES



⅜" H.D. DRILL No. 1541

¼" H.D. DRILL No. 1525 BALL BEARING

¼" H.D. DRILL No. 1480 SEMI BALL BEARING

½" LT. DUTY DRILL No. 1498

¼" DRILL No. 1485

¼" DRILL No. 1475

SIOUX

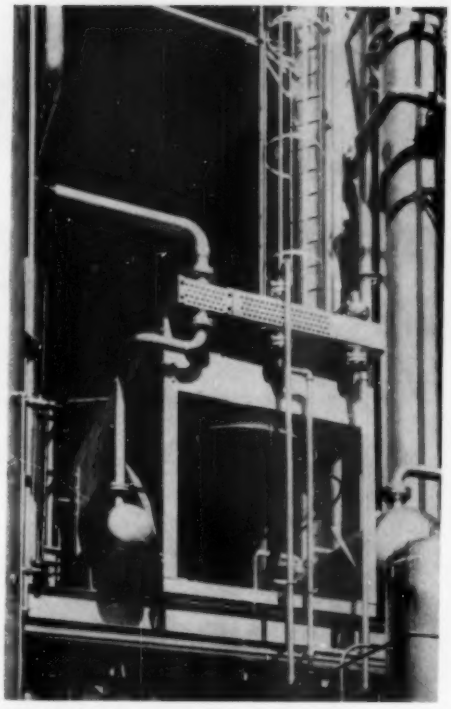
ALBERTSON & CO., INC.

SIOUX CITY, IOWA, U. S. A.

AIR IMPACT WRENCHES • AIR SCREWDRIVERS • "PELICAN" NUT ACCUMULATORS • ELECTRIC IMPACT WRENCHES • DRILLS • GRINDERS • SANDERS • POLISHERS • VALVE FACE GRINDING MACHINES • SCREWDRIVERS • PORTABLE SAWS • FLEXIBLE SHAFTS • ABRASIVE DISCS

TABLE 2—EXCHANGER COST COMPARISON

Process sections and exchanger—	Total duty (B.t.u./hr.)	Air cooler, °F. Temp. in	Air cooler, °F. Temp. out	Trim cooler, °F. Temp. in	Trim cooler, °F. Temp. out	Water saving (g.p.m.)
Crude-vacuum unit:						
Crude tower top reflux cooler (C105)	16,000,000	233	200	None	None	1,467
Heavy naphtha cooler (C109)	3,950,000	305	140	140	95	
Kerosine cooler (C110)	7,850,000	375	140	140	95	751
Light gas-oil product cooler (C111)	5,050,000	490	140	140	110	
Vacuum tower, bottom reflux cooler (C112)	4,100,000	680	450	None	None	234
Cat cracker:						
Fractionator OH cond. (C301)	71,500,000	290	140	140	120	4,025
Gasoline splitter OH cond. (C316)	30,740,000	225	130	None	None	1,710
Decanted oil product cooler (C323)	7,950,000	675	200	None	None	454
Hydrogenation unit:						
Lean-oil cooler (C426)	7,510,000	317	140	140	100	419
Reformer:						
Reformate splitter OH cond. (C509)	15,410,000	230	150	None	None	838
HV reformate product cooler (C512)	14,500,000	320	140	140	120	386



ABOVE-GRADE air cooler is used for three different services. Photo courtesy of Griscom Russell Co.

overhead stream from 140° to 120° F.

The capital-cost comparison is summarized in Table 1.

The total estimated cost for conventional water-cooling equipment was $140,000, with the shell-and-tube equipment itself costing 32% of the total figure. The total estimated cost for air cooling was $108,000, with the air-cooler cost representing about 67% of the total figure.

The dollar savings using air cooling was $32,000 or 23%.

Operating cost for the conventional water-cooling system in this case was estimated to be $16,200 per year. This figure includes all of the costs involved in supplying treated water for cooling plus maintenance costs due to attendant water corrosion.

The operating cost for the air-cooling system was estimated at $3,000 per year. This cost includes the electrical power required to operate the fans and the cost of applying treated water to the **trim cooler.** It was assumed, in arriving at the operating costs for the air cooler, that power **used** would be equal to one-half the horsepower installed.

Since a relatively high ambient temperature (95° F.) was used in the design, the actual power used will be considerably below the installed horsepower. (This installation was designed to cool from 250° to 140° F., and running as a flooded condenser operated from January 1 to May 1 at an average of 30% of the total installed horsepower.)

Toledo Refinery Costs

Sohio's new, integrated 60,000-bbl. refinery at Toledo was located adjacent to an older 20,000-bbl. plant. All cooling for the older plant was done with about 20,000 g.p.m. of once-through lake water.

In preliminary cost studies, it was apparent that the existing water line to the lake was not large enough to handle the additional cooling-water requirements. Addition of a cooling tower was found to be cheaper than the building of a second line to the lake. Cooling-tower requirements were set at 30,000 g.p.m.

Based on economic study, air coolers were selected for 11 units shown in Table 2. Use of the air coolers caused a substantial reduction in cooling-tower size. And real savings in cooling tower and water piping also resulted.

Capital cost comparison . . . The total estimated cost for water-cooling facilities for the 11 services was $410,000. Of this, $190,000 represented exchanger costs, and $220,000 is attributable to cooling tower and piping.

The total cost for the air-cooler system ran $500,000. Air coolers ran $249,000; trim coolers amounted to $63,000; and cooling tower totaled $188,000.

Operating cost comparison . . . The operating costs for water cooling were estimated at $88,500 per year. This figure includes all cooling plus the costs involved in supplying treated water for **maintenance** costs due to attendant water corrosion.

The operating costs for the air coolers were calculated at $23,000 per year. This assumes that the cost of electric power to operate the fans is based on 50% of the installed horsepower. The operating costs also include all costs required to supply treated water to the **trim** coolers. Maintenance costs due to water corrosion in the trim coolers is also included.

The operating savings realized by using air cooling amounts to $65,500 per year. This represents a 74% savings.

The payout for the additional capital for air cooling is:

$$\$90{,}000/\$65{,}500 = \textbf{1.4 years}$$

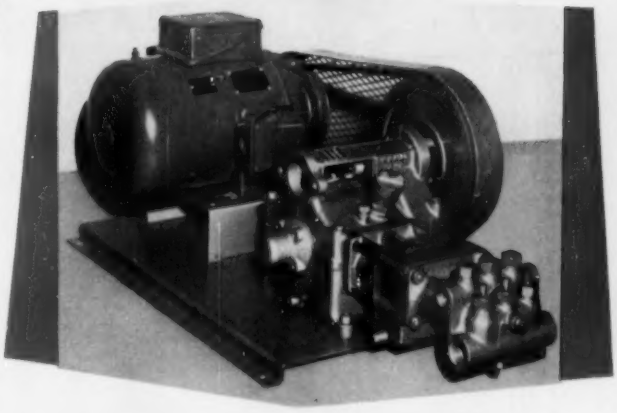
NEW
TXT TRIPLEX PUMP

offers you greater versatility, higher accuracy and lower operating cost

This new TXT Triplex Pump is a real performer for accuracy, dependability and economy. It gives you precise control for blending service . . . provides large volume, high pressure corrosion inhibitor injection . . . handles corrosive or non-corrosive fluids with lower operating cost and greater dependability than comparable units.

TXT Triplex Pumps can be driven by electric motor, gasoline engine or steam turbine. They handle pressures up to 1000 psi with volumes to 5 gallons per minute. Capacities are variable by changing the sheave combination. Pumps are equipped with 1" plungers, with other sizes available on order. The fluid end can be mounted on either right or left side of gear box. The entire unit, including prime mover, is mounted on 4" channel iron skids or flat base of 10 gauge metal.

For more complete details and specifications, see your Texsteam representative or write for Bulletin.



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Dependable
HERCULES STUFFING BOXES end Your pumping worries*

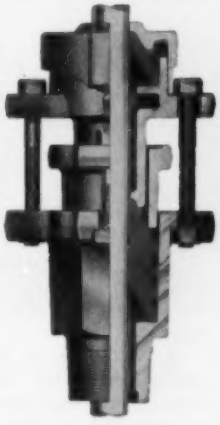
HERCULES Duplex Polished Rod Stuffing Boxes are constructed from high grade malleable iron (55,000 PSI Tensile Strength) and are rated 3,000 pound test. Flexibility and the cone-shaped Packing Rings are the combination of factors which make the HERCULES Stuffing Box without equal for any pumping situation.

HERCULES OIL RESERVOIR UPPER GLAND

**Any HERCULES Stuffing Boxes may be equipped with Oil Reservoir Upper Glands on "problem" wells which pump-off and burn packing. The polished rod moves through the oil in the reservoir which lubricates and cools it.*

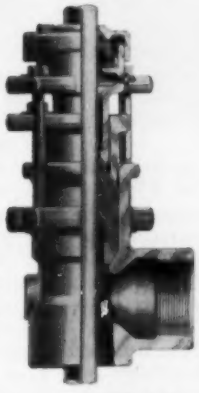
"REGULAR TYPE" DUPLEX POLISHED ROD STUFFING BOX

The old reliable; tried and proved on thousands of wells from coast to coast and in many foreign fields.



"TEE TYPE" DUPLEX POLISHED ROD STUFFING BOX

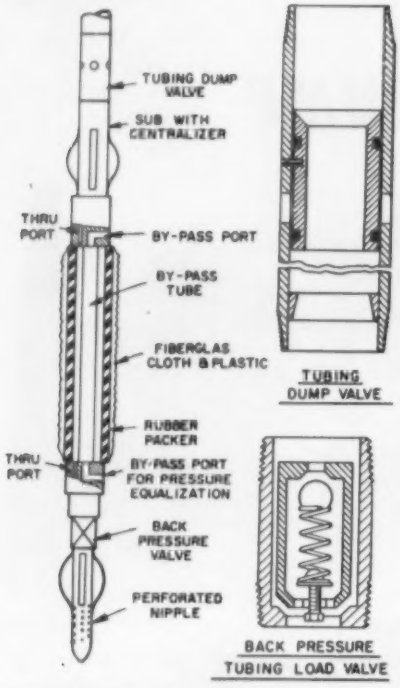
HERCULES "TEE TYPE" Stuffing Box is very compact, only 15" high. It is full opening which allows rods to be run or pulled without removing Stuffing Box body. It is furnished in 2", 2½" and 3" sizes with any API Tubing or Line Pipe Thread.



"TYPE DP" DUPLEX POLISHED ROD STUFFING BOX

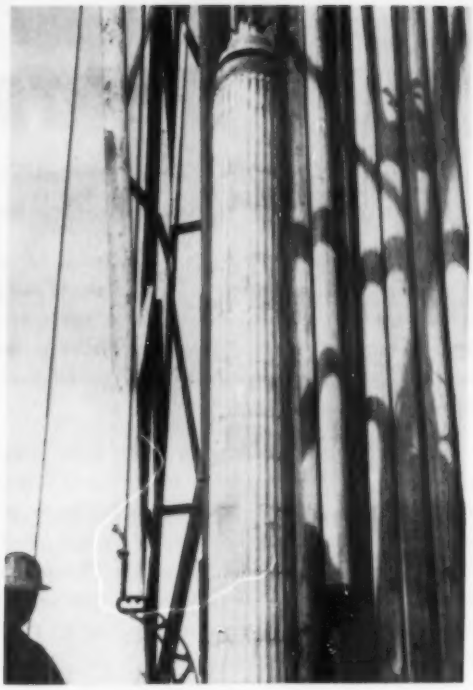
A double packed Stuffing Box for use on high pressure wells and those that flow intermittently. Especially desirable for wells located near buildings, fire hazards or growing crops. Two compression bolts, in bottom sections, are tightened on lower packing set while replacing packing in upper section. Possess same flexibility as the regular and Tee base type.

HERCULES TOOL Company
MANUFACTURERS OF OIL FIELD EQUIPMENT SINCE 1924
GENERAL OFFICES AND PLANT TULSA, OKLAHOMA
Export Representative: Oil Field Equipment Co., Inc., 90 West Street New York 6, N. Y.



CASING-REPAIR EQUIPMENT consists of expandable mandrel, centralizers, adjustable back-pressure valve; and tubing dump valve. Fig. 1.

BRUSH assembly cleans loose scale and casing from pipe. Fig. 2.



PREPARED MANDREL for 13⅜-in. casing is shown here just before being lowered into the well. Plastic is on exterior of corrugated sheet. Fig. 3.

How Pan American repairs casing

with glass-fabric-coated plastic liner

BY E. R. JENNINGS AND R. P. VINCENT
Pan American Petroleum Corp., Tulsa

A NEW METHOD for repairing holes in well casing has been developed by Pan American Petroleum Corp.

At the time of this writing, the method has been used in 13 field wells. It was successful in seven wells, unsuccessful in two, misapplied in two, and inconclusive in two. For the wells tried, the method cost only one-half as much as squeeze cementing.

To be successful, the method calls for substantial pipe or firm backing at the point of repair. But, based on experience to date, the field repair jobs will be effective for years, if not indefinitely.

The new method is one of forming a laminated liner over the hole in the casing. It uses an inflatable rubber mandrel for forcing plastic-impregnated glass fabric against the inside of the pipe. Excess plastic is forced out the hole, forming a seal both inside and outside the casing. Pressure is kept on the plastic while it hardens.

The patch is capable of withstanding differential pressures from 2,000 psi. to more than 5,000 psi. It reduces internal diameter of the pipe by only 0.3-in. Because of this small reduction, additional patches can be made if leaks develop at lower depths. Also, production tools can be run through the repaired interval.

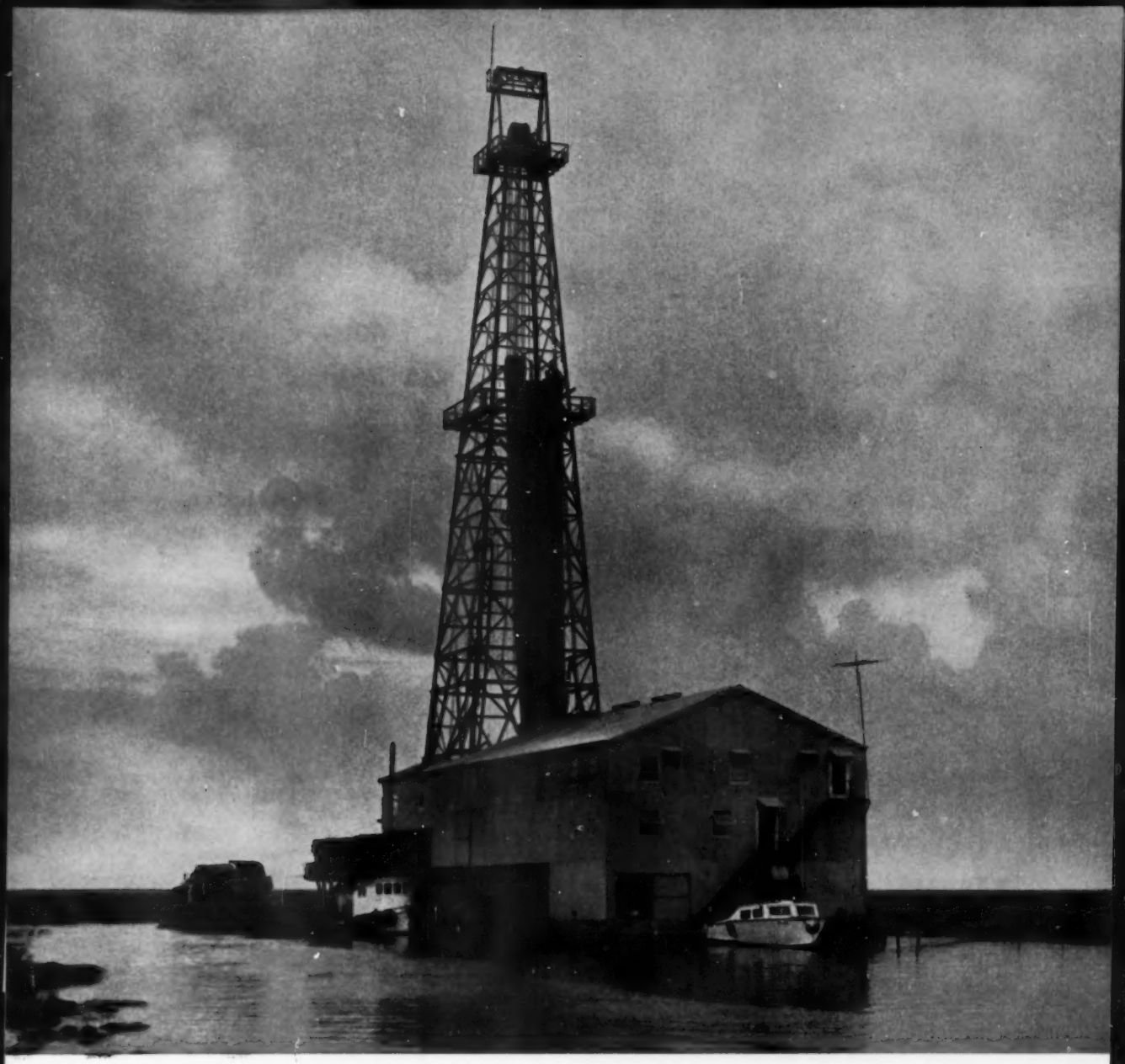
More and more casing leaks . . . Each year there are more casing leaks in producing wells. This is due primarily to corrosion over the producing life of the wells as it is prolonged by proration and secondary recovery.

To repair the casing, the methods commonly used include the cement squeeze or cementing a liner through the damage zone. When damage is extensive the leak area may be isolated by straddle packers on the tubing. Or the casing may be cut at a lower depth, pulled, and replaced with new pipe.

Because of the increasing frequency of casing leaks and the high cost of repairing them, Pan American looked for new repair methods. Out of this work came the new method using the inflatable rubber mandrel and a plastic-impregnated glass-fabric lamina. Strength of this material is high. Also, it can be pressure molded to fit complex shapes. These facts make it ideal for casing repair.

Laboratory studies determined the strength of this material in the presence of well fluids, the size of holes which could be repaired, the effect of

This article is a condensation of a paper titled, "A Glass-Fabric-Plastic Liner Casing Repair Method," presented at Southwestern District meeting, API Division of Production, Midland, Tex., March 4-6, 1959.



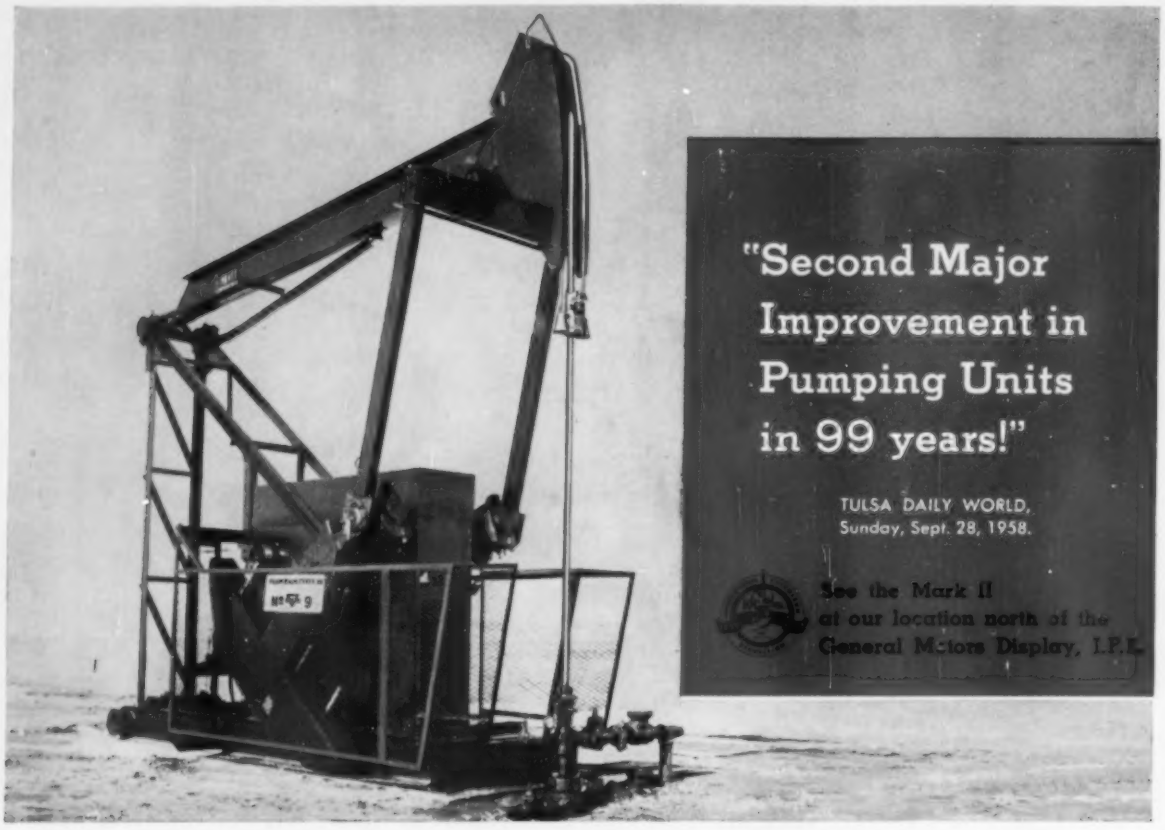
The BELLE CLAIRE Drills Deep. Owned by the Continental Shelf Drilling Corporation, the barge *Belle Claire* is a familiar sight in the Gulf Coast country. Here it is shown sinking a deep well at Lake De Cade, Terrebonne Parish, La. When photographed, the rig had already drilled the hole to 12,000 ft, and the crew expected to go another 4,000.

The rotary line, a Bethlehem 1⅛-in. Purple Strand rope, had been in service for almost a year. Still in excellent condition after 62,000 ft of drilling, this 6x19 line easily handled the heavy pipe and other equipment. For coring, the rig used Bethlehem 6x7 with a coating of bethanized zinc to protect against rust.

Bethlehem Steel Company, Bethlehem, Pa. On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

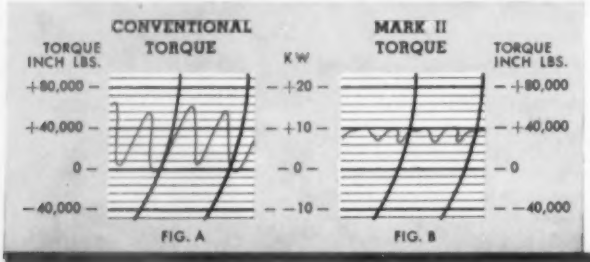
Mill depots and distributors from coast to coast stock Bethlehem rope for the following industries and numerous others:

PETROLEUM • CONSTRUCTION • EXCAVATING • MINING • QUARRYING • LOGGING • MANUFACTURING


"Second Major Improvement in Pumping Units in 99 years!"
TULSA DAILY WORLD, Sunday, Sept. 28, 1958.
See the Mark II at our location north of the General Motors Display, I.P.E.

How the Mark II Unit Pumper
CUTS PUMPING COSTS 20% and more

UNITORQUE is an exclusive advantage of the MARK II Unit Pumper that effects a more uniform torque demand and reduces peak torque requirements as much as 40%. This is brought about through a unique geometric arrangement and a phased counterbalance. Figures A and B show watt meter charts on turnabout comparison tests between a conventional pumper and a Mark II, pumping the same well under identical conditions. Figure A indicates that the conventional unit required a peak load of 14 KW, equivalent to 56,000 inch-pounds of torque. Figure B shows that the Mark II required only 9 KW at peak load, equivalent to 34,000 inch-pounds of torque, pumping the same well with the same motor. This adds up to a substantial reduction in peak torque that the reducer must deliver in order to lift a given load at the polished rod. The result is a major savings in speed reducer size, prime mover cost and in the cost of power.



Quick, Easy, Semi-automatic Counterbalancing — For the first time in the history of the industry, the pumper can, by simply moving a lever forward or backward, employ the unit's energy of rotation to reposition a portion of the counterweight. By this effortless adjustment of the counterweight to meet varying well load conditions, it is possible to eliminate "ninety percent"* of the mechanical failures of gears, pitmans, belts, bearings and shafts. Savings from the resulting reduced maintenance costs can be substantial.

*Sucker Rod Handbook No. 336, Page 169.

FOR COMPLETE INFORMATION about the MARK II Unit Pumper, write for descriptive literature.

OILFIELD EQUIPMENT CORPORATION OF COLORADO
1730 FIRST NATIONAL BANK BLDG. • DENVER 2, COLORADO

EC

well temperature and fluids on curing time, and methods of forming and placing a glass fabric-plastic patch over subsurface holes in well casing.

The casing repair tool . . . Fig. 1 shows the equipment used to make the plastic casing repair. It consists of four units: an expandable mandrel; centralizers; adjustable back-pressure valve; and tubing dump valve.

The expandable mandrel is basically a nylon-reinforced neoprene tube anchored on each end of a rigid tubular inner member by compression clamps. The assembly is lowered into the well on tubing and the neoprene element expanded by applying internal pressure.

The present tools permit placement of a liner 10 ft. in length. Five available mandrels permit repair operations in casing sizes ranging from 5-in. through 13⅜-in. In designing the mandrel a minimum tool-pipe radial clearance of 1 in. and a maximum mandrel expansion of 1¾ in. on the diameter were used.

Pressure can be equalized in the casing above and below the mandrel, when it is inflated, by a series of ports on the lower end of the tool, a bypass tube, and a similar series of ports on the top.

Centralizers are placed immediately above and below the mandrel. These prevent the plastic liner from contacting the casing while lowering the tool into the well.

There is an adjustable back-pressure valve on the lower end of the tool to protect the expandable element from pressures in excess of the preset inflation pressure. This valve passes all pressuring fluids in excess of the predetermined inflation pressure to the tubing-casing annulus. There is a check-valve arrangement in the assembly so that well fluids can enter the tubing freely while the mandrel is being lowered in the well. This maintains a fluid balance with the tubing-casing annulus.

When open, a tubing dump valve in the tubing string immediately above the mandrel allows the mandrel to deflate and permits the tubing to drain as it is removed from the well. This valve consists of a nipple containing a row of four ports spaced 90° to each other. When closed, the holes are covered by a sleeve within the nipple and held in position with a shear pin.

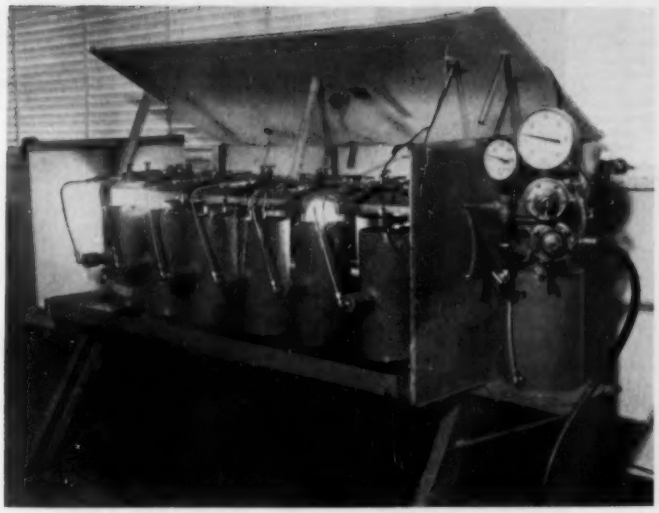
To deflate the mandrel, a steel ball is dropped into the tubing, closing the opening through the sleeve. Pressure applied to the tubing shears the pin and forces the sleeve downward, opening the ports to the casing-tubing annulus.

Casing-repair procedure . . . Before actual installation of the plastic liner, the hole in the casing is located and the casing surface surrounding the leak cleaned. It is very desirable to locate the casing leak within narrow limits, since the liner should be centered over the hole.

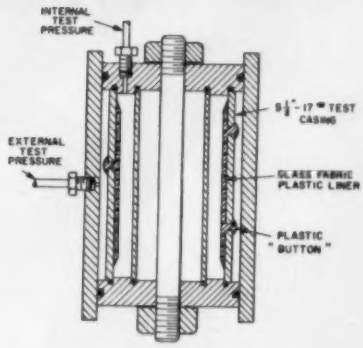
Two methods have been used successfully. The most generally used method is setting a retrievable bridge plug in the casing below the expected repair area. The leak may be located by successive settings of a packer in the casing above the bridge plug and testing both the area between the packer and bridge plug, and the casing-tubing annulus between packer and wellhead.

Once the exact depth of the leak has been determined, the tubing may be removed from the well and segregated from other tubing on the rack so that the patch mandrel may be run in the well on the same tubing. This minimizes errors in tallying pipe in and out of the hole.

A second method uses a hydraulic straddle packer which permits selective pressuring of the casing above, below, or between the two packers. By resetting the tool at different elevations in the casing, the leak may be isolated to an exact depth. One distinct advantage of the straddle packer is that it may be set in a previously repaired section without damage to the liner, since no slips are used on the tool. Again, the identical tubing



How the plastic liner was tested



LABORATORY TEST apparatus to determine the effect of various well fluids on experimental plastic liners consisted of 12 cells, 6 in each of 2 rows. All 12 were manifolded together, with 6 being pressured internally and 6 externally.

Each cell, as shown in cross-section view, was fabricated from 5½-in., 17-lb. casing, 12 in. long.

Each battery of two cells, one for external and one for internal test, was filled with each of these fluids: fresh water, sour crude oil, drilling mud, hydrogen sulfide-saturated brine, salt water, and sweet crude oil. A pressure of 2,000 psi. and a temperature of 140° F. were maintained for 8 months.

New ways Liberty Mutual provides

Protection in depth

to safeguard your people... to cut workmen's compensation insurance costs

Anything you can do right now to cut down on accidents and losses on your jobs will help toward cutting your compensation insurance costs in the future. At Liberty Mutual, we can help you accomplish this by making available an unusually wide range of extra skills and resources.

This is Liberty's protection in depth. Some of its resources are pictured on these pages.

Protection in depth has helped thousands of Liberty Mutual policyholders save money through experience modification. And it has helped us return more than $455 million in dividends.

Now, oil-well drillers can get this same protection in depth from Liberty in a new four-way insurance plan. In addition to workmen's compensation coverage, this four-way plan gives you rig coverage to protect you against loss from fire, blowout, collapse and many other disasters. It also provides general liability coverage and fleet coverage for your trucks and cars.

Liberty's protection in depth can be yours today. Contact our nearest office for full details.

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(Below)

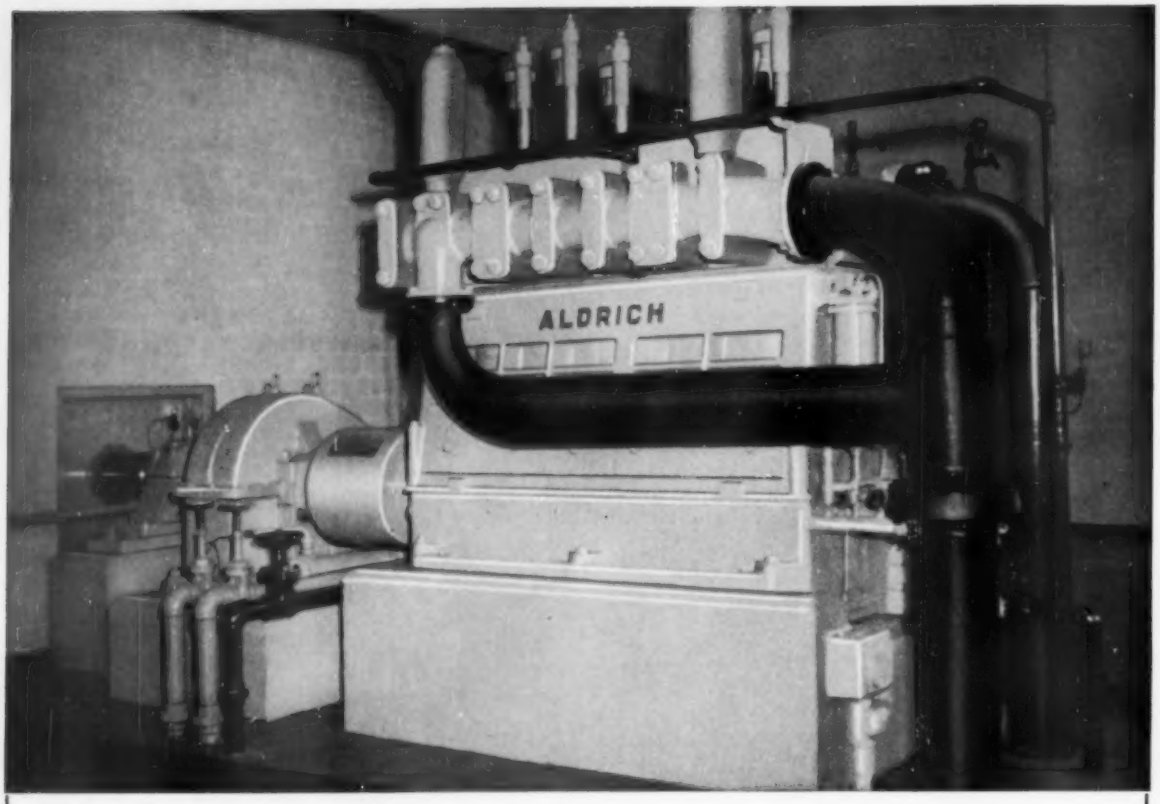
Learning to walk . . . the second time. The facilities of Liberty's two rehabilitation centers are made available to badly injured employees of policyholders. Through therapy and prosthetics know-how, patients help themselves recover, get back on the job.

(Right)

Making dangerous jobs safe. Liberty Mutual's safety engineers can help you cut down on accidents by instructing your man in proper operating procedures. Our safety-engineering services have helped hundreds of oil-well drillers save money through reduced compensation costs.

(Left)

New look at injuries—new savings. In 64 areas of the country, Liberty Mutual retains leading specialists to check the diagnoses of serious cases and assist treating physicians. Result to policyholders: improved medical results and lower compensation costs.



FIELD REPORT

APPLICATION: Pipeline Service

South Saskatchewan Pipe Line Company, Cantuar, Saskatchewan.

PUMPS: 3 Aldrich Quintuplex,

4½" plungers, 6" stroke. Each having a capacity of 20,000 b/d at 300 RPM, 1200 pounds pressure.

OPERATION STARTED: December, 1955

EXPERIENCE TO DATE:

Units pump viscous crude oil over 158 miles of 16" main line pipe. Customer reports exceptionally fine field service with routine maintenance only.

Field parts stock available in Carmi, Ill.; Charleston, W. Va.; Casper, Wyo.; Houston; Los Angeles; Odessa and Tulsa. For further information, write the Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.

the toughest pumping problems go to ALDRICH

TABLE 1—SUMMARY OF FIELD INSTALLATIONS

Test No.	Well and field	Depth of Repair ft.	Casing size (in. and lb.)	Temp. at Repair °F.	Results	Remarks
1	Well No. 1 ..... No. Wyoming	472	6⅝, 20	64	Successful	Liner set under liquid—Tested to 2,000 psi.
2	Well No. 2 ..... No. Wyoming	4,194	7 , 23	110	Successful	Liner set under liquid—Tested to 2,000 psi.
3	Well No. 3 ..... Central Texas	4,098	5½, 15.5	80	Successful	Liner set under liquid—Tested to 1,200 psi.
4	Well No. 4 ..... No. Louisiana	3,672	5½, 17	150	Successful	Liner set under liquid—Repair not pressure tested —Production tests showed water shutoff.
5	Well No. 5 ..... West Texas	3,242	5½, 17	78	Successful	Liner placed under liquid—Tested to 2,000 psi.
6	Well No. 6 ..... South Texas	2,400	13⅜, 48	110	Successful	Liner set under liquid—Tested to 2,400 psi.
7	Well No. 7 ..... South Texas	2,400	13⅜, 48	110	Successful	Liner set under liquid—Tested to 2,400 psi.
8	Well No. 8 ..... West Texas 4,594 No. Louisiana	4,580	5½, 17	78	Unsuccessful	Two liners placed in liquid—One tested to 1,000 psi.—One failed under pressure.
9	Well No. 9 ..... No. Central Texas	840	5½, 17	84	Misapplication	Liner set under liquid—Found parted casing.
10	Well No. 10 ..... No. Louisiana	896	10¾, 35	85	Misapplication	Casing deteriorated to such extent there was no backing for liner.
11	Well No. 11 ..... So. Oklahoma 5,056	5,046	7 , 23	105	Inconclusive	Set under liquid—Two liners overlapped to seal 10 ft. of perforations. Total of 40 jet-perforated holes.
12	Well No. 12 ..... West Texas	1,038	5 $\frac{9}{16}$, 22 (Drill pipe)	85	Inconclusive	Liner destroyed during subseqeunt drilling operation.
13	Well No. 13 ..... West Texas 4,301 4,322	4,290	5½, 17	76	Not yet determined	Three liners set in liquid—Successfully placed—No results available.

Note: Tests are not listed in chronological order.

should be used to run the glass fabric-plastic liner that was used to locate the leak.

Cleaning the damaged area. The immediate area in which the plastic liner is to be placed should be free of loose scale and paraffin. Laboratory experiments confirmed by field tests have shown that the following procedure is adequate. Cleaning is done by running a special steel brush assembly on tubing. The brush assembly (Fig. 2) is rotated and reciprocated over an area extending approximately 15 ft. above and 15 ft. below the section of the casing to be required.

Fluid may be circulated through the tubing and out the ports in the brush assembly to displace the material removed by the brushing action. Also, a solvent such as naphtha, alcohol, or gasoline may be used to loosen the deposits on the casing when the leak area is above the fluid level of the well. Field tests show that under ordinary conditions 1 hour of brushing is sufficient. After cleaning, the brushes are removed from the well.

Temperature in the well at the point of leak is determined in order to select the proper type of plastic for the job. Knowing the temperature and the depth of leak, plastics may be chosen with a sufficiently long setting time to allow tubing to be run to the depth of the leak. Generally the well temperature can be determined from well records; if not, a maximum reading thermometer in a pressure-tight capsule can be attached to the brush assembly during the cleaning operation. This has proved to be a satisfactory means of obtaining temperature.

Installing the liner . . . The mandrel equipped with centralizers, back-pressure relief valve, and tubing dump valve is assembled on the rig floor. Generally the upper end of the assembly is supported in the tubing elevators approximately 3 ft. above the rig floor and the lower end is supported on a guard rail or similar object of a convenient height for assembling the liner. This arrangement permits the mandrel to be rotated freely while applying the fabric and plastic.

The expandable neoprene element of the mandrel is coated with a "mold release" agent. This material prevents the plastic from adhering to the rubber. The mold release is allowed to dry to a hard surface.

The fabric is saturated with a catalyzed plastic suitable for the particular job and wrapped around the mandrel. A corrugated fabric outer layer is coated with the catalyzed plastic and also tightly wrapped around the mandrel with the corrugations running parallel to the axis of the tool and bound in place with individual wire ties at 1-ft. spacing along the full length of the mandrel.

A final coating of the catalyzed plastic is applied to the exterior surface of the corrugated sheet. The mandrel is now ready for lowering into the well on tubing. Fig. 3 shows a mandrel for 13⅜-in. casing prepared as described above, ready for lowering into the well.

Caution should be used in lowering the mandrel, particularly when contacting the fluid level, since the impact might damage the soft unpolymerized plastic laminae.

Once the mandrel is centered over the previously located casing leak, it is expanded by pumping fluid down the tubing at a slow rate. The back-pressure valve limits the pressure rise to that required to inflate the mandrel and press the laminae against the casing at the point of repair. The pressure is maintained for 12-24 hours, depending upon the time required to cure the plastic system used under bottom-hole conditions.

At the end of the cure period, the tubing dump valve is opened and the tubing and mandrel are removed from the well, completing the repair operation. The repair can then be tested by conventional methods and the well returned to production.

Results

The glass fabric-plastic casing repair method has been field tested in a variety of applications summarized in Table 1. Tests 1 through 7 were successful in repairing wells where holes or coupling leaks existed. The initial field repair operation, Test 1, Table 1, is still effective, indicating no

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detrimental effects to the plastic subjected to well fluids during this period.

Tests 6 and 7, Table 1, were made in wells being completed for the solution mining of salt. Tests made subsequent to "drilling out" of the cement in both wells showed leaks at the stage cementing tool located in the casing strings at 2,100 ft. Repeated attempts to obtain a shutoff by squeeze cementing failed. A number of cement squeeze repairs were made in Well No. 2 (Test 7), all without success.

Only two remedial measures were possible at this time. One was to recomplete the well by running a smaller string of pipe in the 13⅜-in. casing to seal off the damaged section. This procedure would, however, reduce the production of the wells. Since the operator of the wells was committed to deliver certain quantities of salt daily, the reduction in casing size would make it necessary to drill a third well.

The other method of sealing the leaks was through the use of the glass fabric-plastic liner repair. The relatively low cost of the latter method made it attractive. A liner was placed in each well over the damaged stage cementing tools. The assembled glass fabric-plastic liner and mandrel assembly are shown in Fig. 3 positioned for running in one of these wells. Subsequent pressure tests showed successful seals were made in both wells.

Casing too poor . . . In Test 8, a repair was made at 4,580 ft.; however, subsequent testing showed a second hole 18 ft. above the first. This second hole was repaired and further testing indicated additional leaks.

On the basis of this, it was concluded that a severe corrosive condition existed in this area and the casing was pulled. On the casing removed from the well, 1,500 ft. of pipe was corroded to such an extent that additional leaks would probably have occurred in the near future.

Misapplied . . . Test 9 in Table 1 is classified as a misapplication. Examination of the casing after failure of the repair showed that the casing had parted and the ends were separated by 9 in. In Test 10 in Table 1, the casing had deteriorated to the extent that it failed when the mandrel was expanded. These two examples show that it is necessary to have a firm backing on which to form the glass fabric-plastic laminae for the repair to be successful.

Inconclusive . . . Test 11 in Table 1 shows use of the plastic liner for sealing unwanted perforations. The limited length of the mandrel (10 ft.) made it necessary to individually place two overlapping liners with a total length of 18 ft. in order to cover the 12-ft. perforated zone. The ends of each overlapping liner were tapered to prevent an increase in thickness of the joint.

This application is listed as inconclusive, since it is probable that an error in pipe measurements resulted in the liner being placed below the perforated zone. This probability is indicated by go and no-go gages run in the well; however, final proof as to the relative positions of the liner and perforated interval will have to be determined by a caliper survey. This survey has not been made.

The effectiveness of the repairs in Tests 12 and 13 was inconclusive. Subsequent drilling opeartions in Well No. 12, performed prior to testing, destroyed the glass fabric-plastic liner. Test 13 involved the placement of three liners in a well on which a corrosion survey was being made. Subsequent pressure tests indicated a small leak still existed; however, it is believed that there was a fourth hole in the casing not found at the time of the initial casing survey. It is planned to remove the casing from this well to permit visual inspection of the casing repair and the external corrosion to determine the remedial measures required to protect other wells in this field.

Economics good . . . Cost of the fabric-plastic repair method including rig time for pulling the well and running the repair in the 13 tests listed in Table 1 have averaged approximately 50% less than the estimated cost of repairing the damaged pipe by squeeze cementing. Rig time for placing the well back on production is not included since this operation would be necessary in any repair method. The reasons for the low cost of this repair method compared to that experienced with that of other methods are:

1. Less rig time required.
2. Well off production for a shorter time.
3. No heavy equipment other than the pulling rig required.
4. Cost is independent of well depth except for the additional rig time to run tubing to the greater depth.

Other potential applications . . . The glass fabric-plastic method of placing an impermeable liner in producing wells need not be confined to the repair of casing leaks. In the course of routine drilling and production operations, other uses of the tool will develop. Some of the additional applications currently being investigated are:

1. Sealing leaks in tubing.
2. Plugging off water sands in air drilling operations.
3. Selectively controlling fluid entry in open hole completions.
4. A method of controlling unconsolidated sands in open-hole completions.
5. Controlling input profiles in water or gas injection wells.

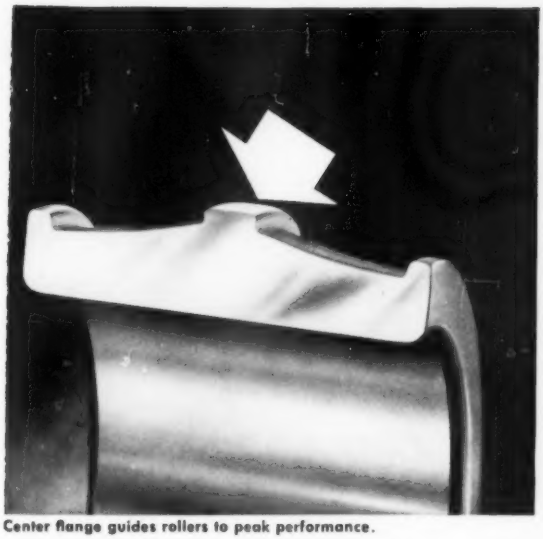
Links feed off extra wire safely

SINCE it has become common for drilling lines to be bought approximately double the length necessary and then fed off a few feet at regular intervals, the problem of providing a safe, easy way for feeding off the extra wire rope presents itself.

On a workover rig of Petroleos Mexicanos on well No. 37 in the Poza Rica field, this simple means was found.

It consists of two links which are fastened to the plate at the bottom of the leg of the standard rig with a clamp at the top to hold the dead line solid. About 1 in. below the stationary clamp, another clamp is installed in case there is slippage in the main clamp, it is readily detectable.

When it is time to feed the line from the spool beneath the floor, the movable clamp is dropped about 3 ft. and refastened. Then the upper bolts are loosened and the derrick line allowed to feed off so that the wear is distributed throughout the entire length of the line.



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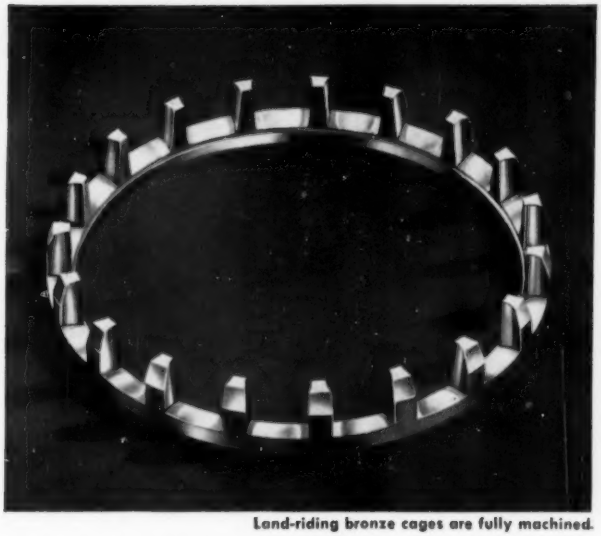

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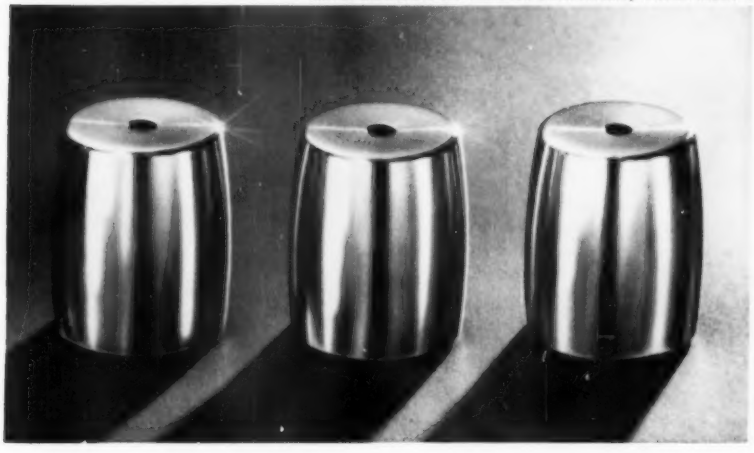

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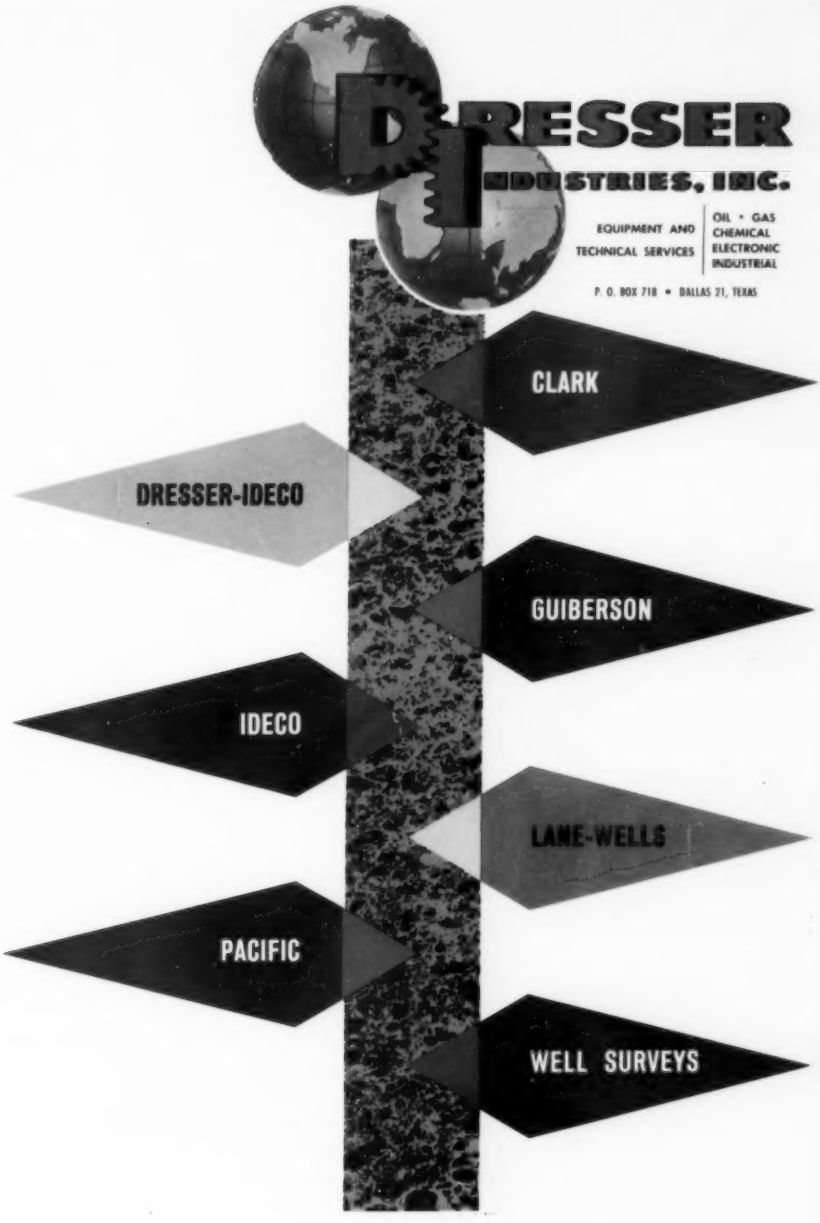

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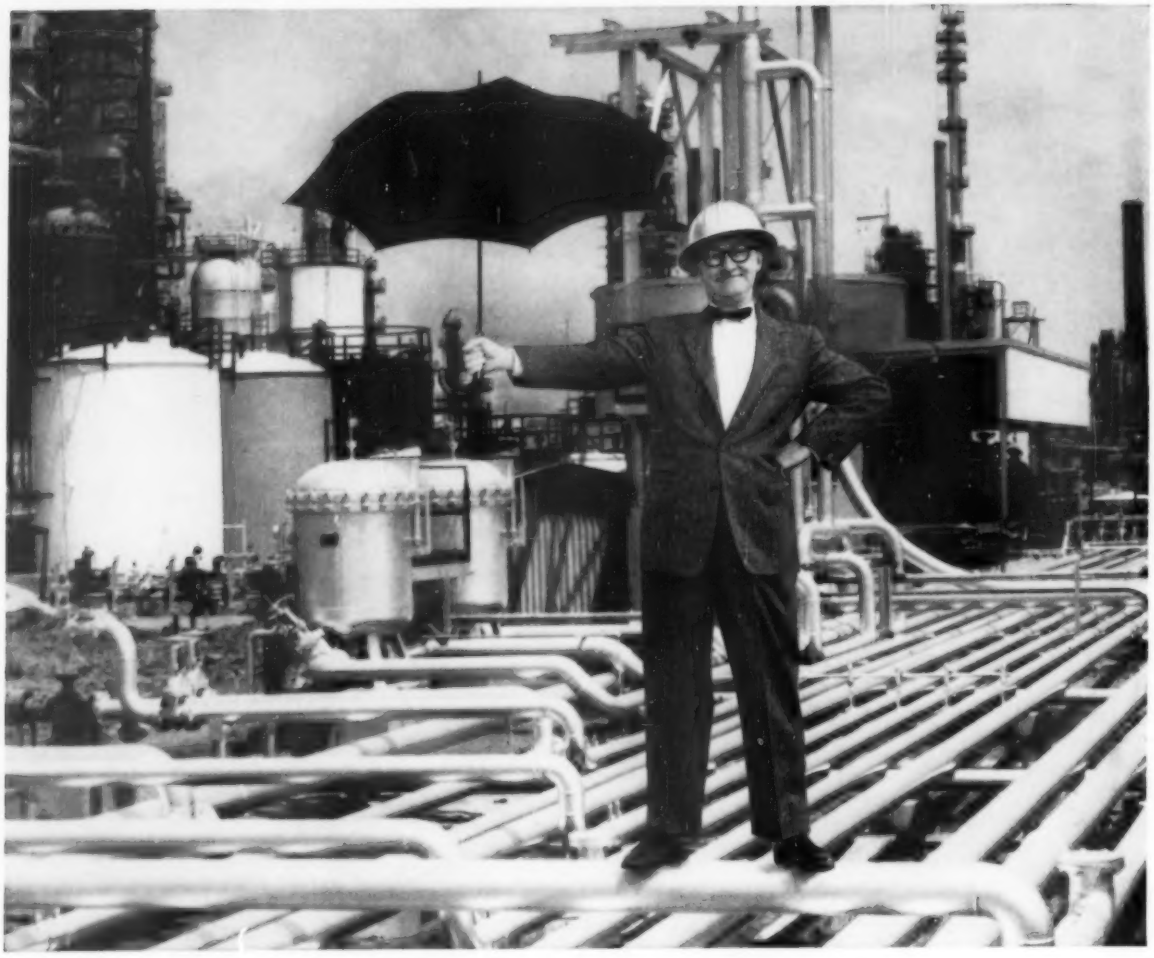

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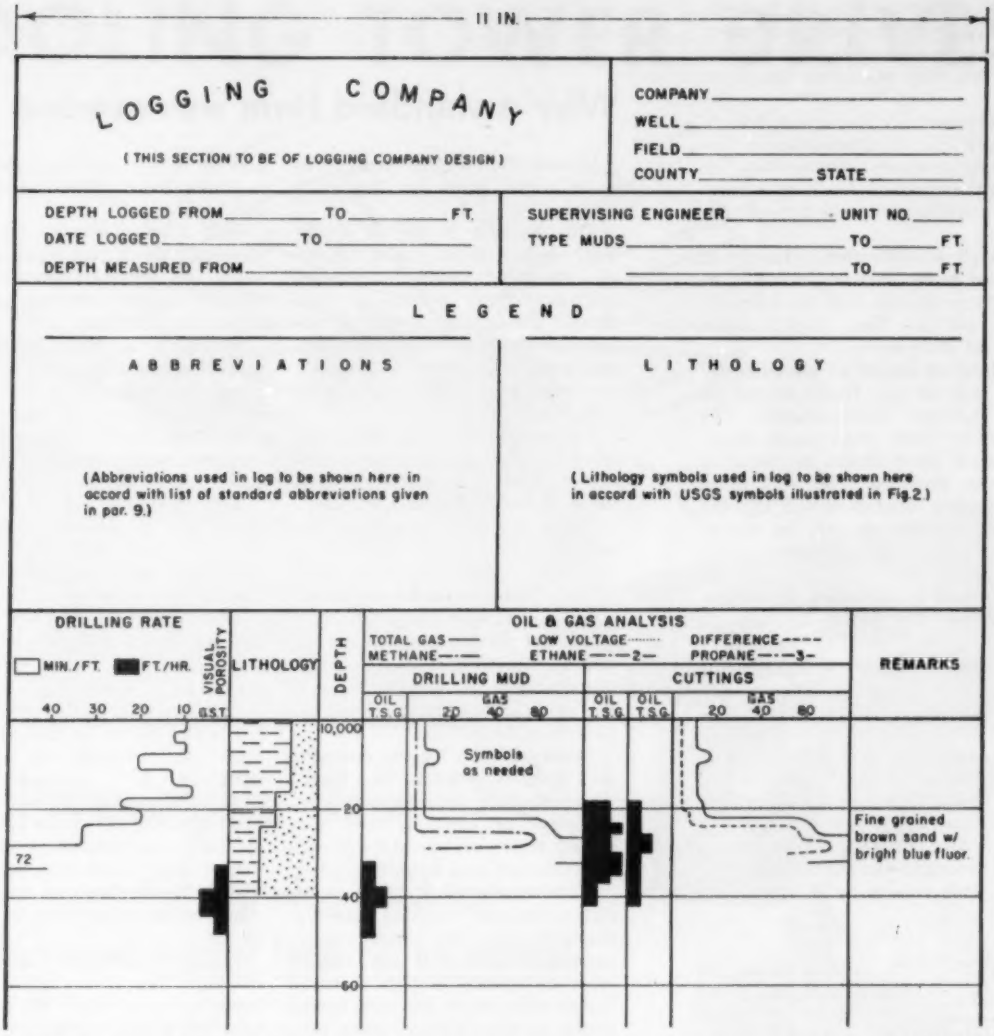


NOTE: The letters "T.S.G." shown in column headings for visual porosity, drilling mud—oil, and cuttings—oil indicate trace, show, or good fluorescence. However, any appropriate scale is acceptable.

STANDARD API hydrocarbon mud-log form. **Fig. 1.**

API standardizes mud-log form

Wide use of this form by mud-logging service companies and operators will wipe out much of the current confusion and difficulty operators now experience in using mud-log data due to widely varying types of reports.

BY ROBERT J. ENRIGHT
Dallas District Editor

A STANDARD hydrocarbon mud-log form has been developed and approved by the American Petroleum Institute.

The new standard form, API RP 34, was developed by a subcommittee of the Steering Committee on Production Practice (of the Central Committee on Drilling and Production Practice) of API's Division of Production.

It represents an effort to achieve standardization of just those elements of a mud log which are now in wide use—though used, perhaps in a different manner by different service companies.

API doesn't recommend the form as the ultimate in mud-log reporting because it recognizes that the industry is investigating and using new, different, and perhaps better logging methods.

It feels that the form is entirely adequate now, however, and intends to modify the form as new logging methods are devised and new kinds of information recorded and reported.

The recommended new report differs in many ways from any now in

use, the API says. But the Institute hopes that operators and mud-logging firms will see such merit to standardization that they will adopt the form.

What it reports . . . The new API form (shown in Fig. 1) contains space for:

. . . **Log company identification** including the name of the company and such decorative design as it might desire.

. . . **Well identification.** This space is located in the upper-right corner of the form so that the well can be easily picked out of files. Identification should be complete.

. . . **Interval logged** as identified by depth, date of log. Depth should be from drill-pipe measurements. The zero point from which such measurement is taken should be noted in the space provided. The API notes that on other varieties of well logs the institute recommends that the top of the rotary-drive bushing serve as the zero point.

. . . **Names of personnel**—more specifically the supervising engineer on the job.

. . . **Type of equipment** used on the job.

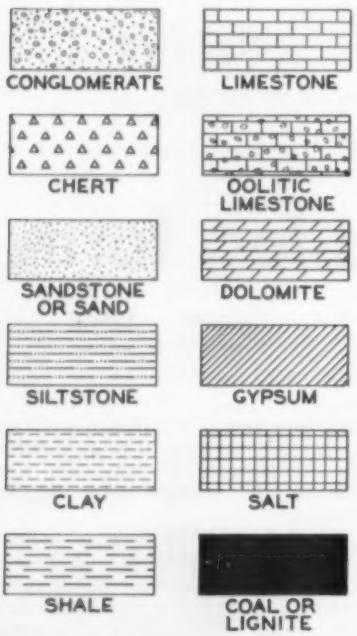
. . . **Drilling-rate curve.** This is plotted on either a minutes per foot or feet per hour basis with drilling-rate increases shown by an excursion of the curve to the left. Offscale values are shown numerically as illustrated in Fig. 1. The curve should be plotted with a "rounded block" solid line. The initial scale should be shown at the top of the column, with subsequent new scales shown in the body of the log. Mechanical data (new bit, etc.) should be shown in the drilling-rate column.

. . . **Visual porosity curve.** Presentation of this curve is optional. If it is used, however, it should be plotted on the right side of the drilling-rate column in solid-block style with values increasing to the left. Any appropriate scale is acceptable.

. . . **Lithology.** This column should be plotted in percentage of sample of the occurring rock types. Lithology symbols used should be those adopted as standard by the U. S. Geological Survey. (Fig. 2).

Sand percentage as found in a sample should be plotted from the right edge of the column with increasing percentages shown as excursions to the left.

. . . **Depth.** The standard depth scale used in the form is 5 in. equal 100 ft. Heavy horizontal lines an inch apart



STANDARD lithology symbols for use with form. Fig. 2.

Why a standard form was needed

Use of mud-logging procedures made rapid gains in the early 1950's.

This was due largely to an industry-wide, all-out effort to use all reasonable means for finding and evaluating potentially productive oil or gas zones encountered in drilling. The trend was especially noteworthy in exploratory wells where most mud-logging is done.

The number of service companies offering mud-logging equipment and services increased along with the gains in logging activity.

These companies developed procedures that are generally similar but which, in some respects, differ widely. Prime reason for the differences is that it is generally recognized that many factors in normal drilling operations interfere with the obtaining of quantitative mud logging data on original oil and gas content of formations.

Likewise, each logging company developed its own reporting forms. These naturally varied greatly from company to company and also among major oil operators providing their own mud-logging facilities.

Considerable confusion and difficulty in using mud-log data was inevitable when oil-company operators receive these widely varying types of reports. Report variation occurs frequently in local areas where an operator uses more than one service company. This is always a problem when a company is active over a wide area.

Clamor for standard form . . . The problems of handling, filing, and correlating data from reports of various sizes which presented data differently, led representatives of several major oil companies to urge the API to create a committee to review the problem and develop standards.

Such a committee was set up. It was made up of two major groups —one of operators and one of service-company representatives— under one chairman.

Members of both groups expressed strong feelings against hindering continued development by service companies of mud-logging techniques. The committee did not therefore suggest standardization of equipment or operating procedure.

The committee's general assignment was to develop reasonably similar methods. by which service companies could report mud-log data to operators.

Operators generally prefer a narrow report to facilitate comparison and filing with standard sized electric and radioactive logs.

Service firms, on the other hand, like wider forms so that they can more easily include all pertinent data.

General design of the report heading in the new form should be similar to that already specified for electric and radioactivity log forms. This is a real advantage when handling or reviewing large amounts of data.

Standardization of symbols for lithology and of the relative positions for reporting the different data will greatly facilitate the comparison of this data as submitted by different logging companies.

Although the sequence or relative positions of the columns are specified, the column widths may be varied to meet requirements of the procedures used. This flexibility will provide adequate space for reporting added data as mud-logging procedures are improved.

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Let a typical Mr. Independent Distributor tell what's been going on in the oil business recently:

• **Drilling Comes of Age**—"Oil well drilling has come of age since World War II," said this Texas distributor. "There was a day when setting up a rig in a new location meant moving half a distributor's store out there. A telephone call to

The independent distributor's store is a big-time operation with better stocks than ever.

the store was likely to end with a reminder to 'Bring a 4x1 swedge.' The distributor's man knew what that meant. It took as long then to set up a rig as it does now to bring in the well.

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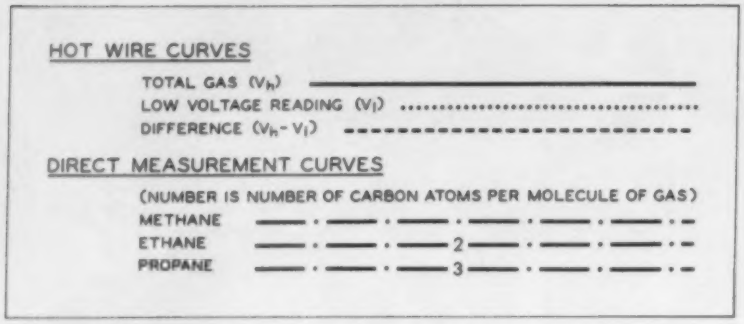

STANDARD curve symbols for use with form. **Fig. 3.**

represent 20-ft. intervals, with lighter lines at 0.1-in. intervals representing 2-ft. intervals. Line weight can be selected so that only the heavy lines will reproduce in photographic processing or printing.

. . . **Oil and gas analysis.** The heading for the large column describing hydrocarbon analysis of the drilling fluid and cuttings should be designed by the logging company in accordance with the kinds of analyses made.

All gas curves should be plotted in the "rounded block" style shown. Initial scale used should be shown in the column heading with scale changes shown in the body of the log where made.

Offscale readings of short duration should be shown by numerical values.

Short sections of each of the lines used for curves plotted from the analysis should be illustrated in the column heading using standard curve symbols (Fig. 3).

A left-side subdivision of the drilling-mud column should be used to show oil in the drilling mud. Oil shows should be indicated by the solid-block type of curve, with increases registered by excursions to the right. Any appropriate scale is acceptable.

Curves showing gas in the drilling mud, plotted in the rounded-block style, go in the right-hand subdivision of the drilling-mud column. Increases in show volume should be recorded as excursions to the right.

Offscale readings of substantial duration require a scale change so that the entire curve is contained in the column.

Drilling-mud characteristics should be shown in the body of the log using standard symbols. Resistivity of mud, mud cake, and mud filtrate should be measured in ohm-meters and recorded on the log using standard symbols. The mud-weight unit recently recommended by the API is the "gradient unit, psi. per 1,000 ft. of depth," although the density units are still acceptable.

Standard cutting-analysis method is the same on the form as that for drilling mud, except that two oil columns may be used. If two are used, both are at the left of the cuttings columns. That farthest to the left is for cuttings which both fluoresce and yield a carbon tetrachloride cut. If the second oil column isn't used, the CCl_4 cuts from cuttings which don't fluoresce should be reported in the "remarks" column.

. . . **Remarks.** This column is optional. It should be used at the logging company's discretion for recording observations not otherwise logged.

The dimensions . . . The committee does not specify over-all dimensions of the form.

It does specify an 11-in. width for the grid and a depth scale of 5 in. equal 20 ft. of well depth. The committee recommends that the relative proportions of the form not be exceeded to too marked a degree.

The full log heading should accompany the first daily log report on a well as shown in the illustration. Thereafter, an abbreviated version giving only minimum information in addition to the column heading and scales is required.

ABBREVIATIONS FOR USE WITH FORM

NB	New bit
NCB	New core bit
CO	Circulated out
DST	Drill-stem test
LAT	Logged after trip
TG	Trip gas
NR	No returns
DS	Directional survey
DC	Depth correction
W	Weight of mud
CK	Filter cake
V	Viscosity, API, seconds
F	Filtrate, API, cubic centimeters
S	Salinity ppm Cl— gpg Cl—
R_m	Mud resistivity, ohm-meter
R_{mc}	Mud-cake resistivity, ohm-meter
R_{mf}	Mud-filtrate resistivity, ohm-meter

(Only the abbreviations actually used on the log need be shown on the log heading. If new descriptions which require abbreviation come into use, other logical abbreviations may be used.)

Nelson Refinery Construction Index

Appears in the engineering section in the first issue each month.

Compiled by W. L. Nelson, petroleum refinery consultant, Tulsa.

The Index was explained October 1, 1956 (page 110) as well as the Indexes of Individual Items of Equipment that appear on the Costimating Page in the first issue of the months of January, April, July, and October.

Index (1946 = 100)

	1950	1954	1956	1957	1958	Dec. 1958
Pumps, compressors, etc.	138.2	166.5	192.0	206.7	214.7	222.0
Electrical machinery	134.9	160.0	175.0	188.9	192.7	193.1
Internal-combustion engines	126.0	150.5	164.0	173.9	178.3	178.3
Instruments	127.8	154.6	182.1	187.4	194.9	197.0
Heat exchangers	140.0	171.7	190.7	203.6	181.2	175.8
Miscellaneous equipment average	*126.2	160.7	180.5	192.1	192.4	193.2
Materials component	149.5	174.6	190.4	201.9	204.2	206.5
Labor component	144.0	183.3	198.2	208.6	220.4	224.7
Nelson construction index	146.2	179.8	195.3	205.9	213.9	217.4

*Used in computing the Nelson Index until April 1952. This is slightly different from the average of the Miscellaneous Equipment Items shown above.

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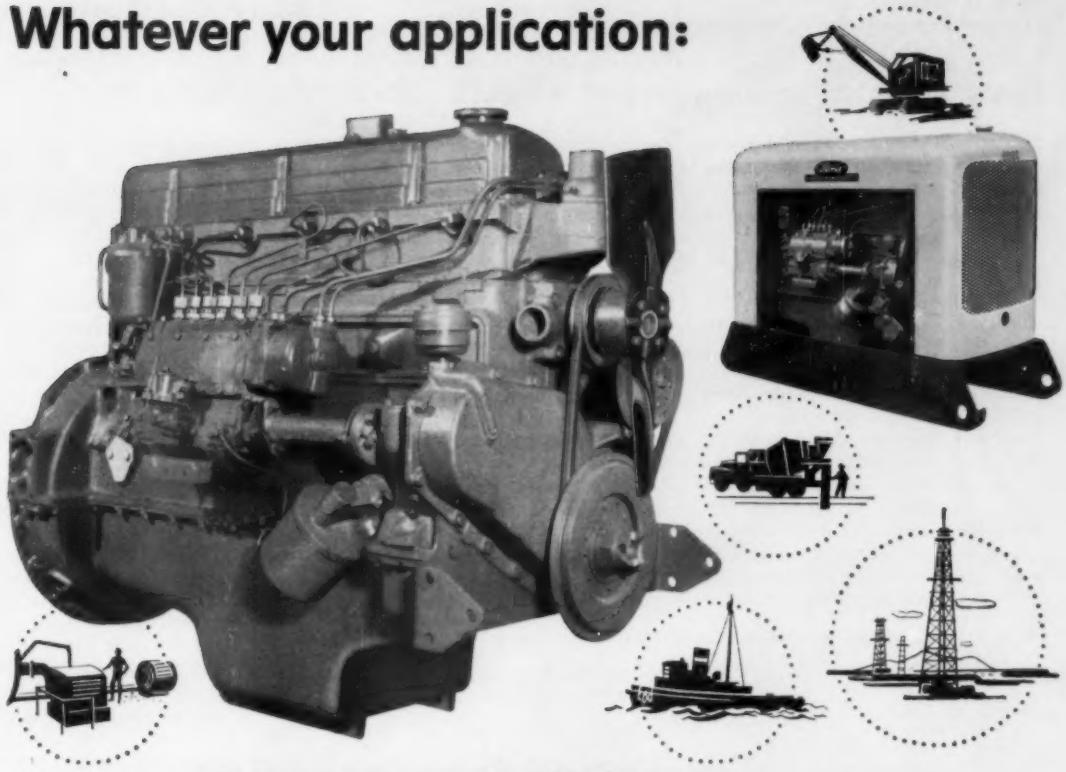

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	Continuous	48 @ 2250	77 @ 2250
Torque	Dynamometer	151#′ @ 1600	236#′ @ 1600
	Continuous	121#′ @ 1600	189#′ @ 1600
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BY W. L. NELSON
Technical Editor and Petroleum Consultant

How type of management affects labor requirements

MAJOR or large refiners, because of their responsibility for the entire industry, must employ more workmen and a larger salaried staff than small or independent refiners. The situation at three periods is indicated in Fig. 1.

If each of the refineries in the United States is multiplied by the number of employes indicated in Fig. 1 for its size, the total checks reasonably well (plus or minus 10%) with the total number of productive workmen as of that date. However, the small refiners of Pennsylvania are an exception—for them, the number of employes is three to four times the number indicated in Fig. 1. Likewise, newer large-unit plants require fewer employes (the new 130,000-bbl. Tidewater plant on the Delaware River is said to employ only 39 men per 10,000 bbl. per day of capacity), whereas older lube-type plants may employ more than 400 workmen per 10,000 bbl. per day of capacity.

The same general relationship also applies to salaried staff. During 1955 the average number of employes per 10,000 bbl. per day of capacity was 249 (see Process Costimating No. 41, February 16, 1958, p. 163) of which 164 were productive workmen and the remaining 85 included all clerical and salaried staff except officers. This indicates 10-15 supervisory jobs per 10,000 bbl. per day of capacity, whereas most 10,000-bbl. independent refiners would not employ more than seven supervisory employes. For each 5.3 men with vocational or apprenticeship skills, 1 engineer with 4 years of college training is required (Anon., Teaching Plant Men New Technology . . . , Nat. Pet. News, May 1, 1946, p. R-323). Only a few industries such as metal mining, automotive manufacture, chemical manufacture, and the hydroelectric industry require more college-trained men than petroleum refining.

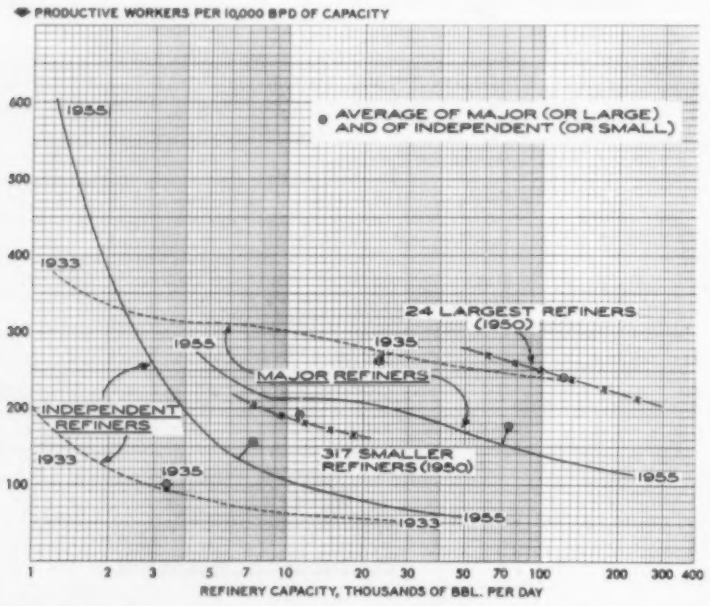
Although the productivity of refinery employes was about the same in 1955 as in 1935, there are significant differences in the employment situation at these two dates. About the same number of employes per barrel of crude oil (about 250 per 10,000 bbl. per day capacity) were employed at both times. This is a productivity of about 100 based on 1956 (see Process Costimating No. 41, February 16, 1958, p. 163), but in 1935 the number of productive workers was about 214, whereas in 1955 it was only 164. Thus, in 1955 more supervisors, technically trained personnel, liaison men, and analytical investigators were needed. In addition (see Fig. 1) the major refiner of 1955 has succeeded in reducing the number of employes, whereas independent refiners now find it necessary to employ more men than in 1935. The over-all situation is summarized in Table 1.

None of these comparisons should be interpreted as derogatory to major-refinery management. Large organizations have certain advantages and are certainly needed in our modern economy, but they also encounter formidable obstacles such as organized labor, the clumsiness of committee decisions, and natural competition between employes, not to mention the target that they afford to politicians and too certain elements of the public.

TABLE 1—OVER-ALL STATISTICS CORRESPONDING TO DATES OF FIG. 1.

	Employes per 10,000 B/D of Capacity		
	1935	1950	1955
Average for U.S.A.—			
Productive workers*	214	218	164
Others	40	80	85
Total	254	298	249
Productivity Index†	100	85.2	102
Productive workers*			
Major refinery management	265	‡245	180
Independent management	105	‡195	160

*A term used by several government agencies. †See Process Costimating No. 41, Feb. 16, 1958, p. 163. ‡A slightly different basis from the other data, namely, the 24 largest and 317 smaller refineries.



EMPLOYES per 10,000 bbl. per day of refining capacity during 1935, 1950, and 1955. Fig. 1.

References

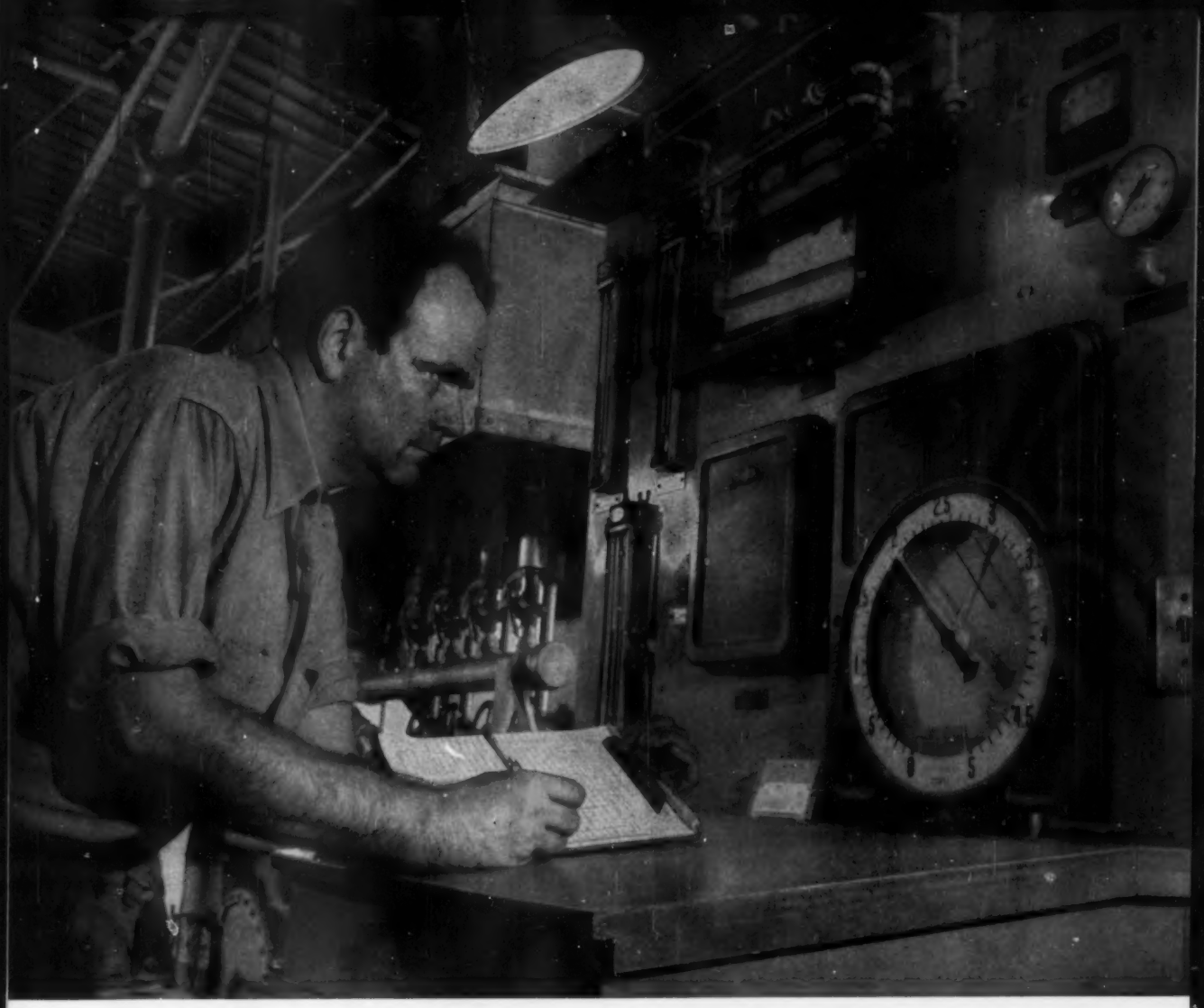
1. Nelson, W. L., "How Many Employes in a Refinery?" (The Oil and Gas Journal, June 25, 1956, p. 120).

2. Nelson, W. L., "How Is Productivity of Refining Labor Changing? (The Oil and Gas Journal, Sept. 24, 1956, p. 159).

3. Anon., "Transforming Crude Oil Into Useful Products," NPN, Feb. 5, 1936, p. 263.

4. Staff, "Petroleum Refineries Operating in United States," (The Oil and Gas Journal, Mar. 28, 1935, p. 119).

5. Nelson, W. L., "Economical Size of Refinery," (The Oil and Gas Journal, Mar. 23, 1959, p. 102).



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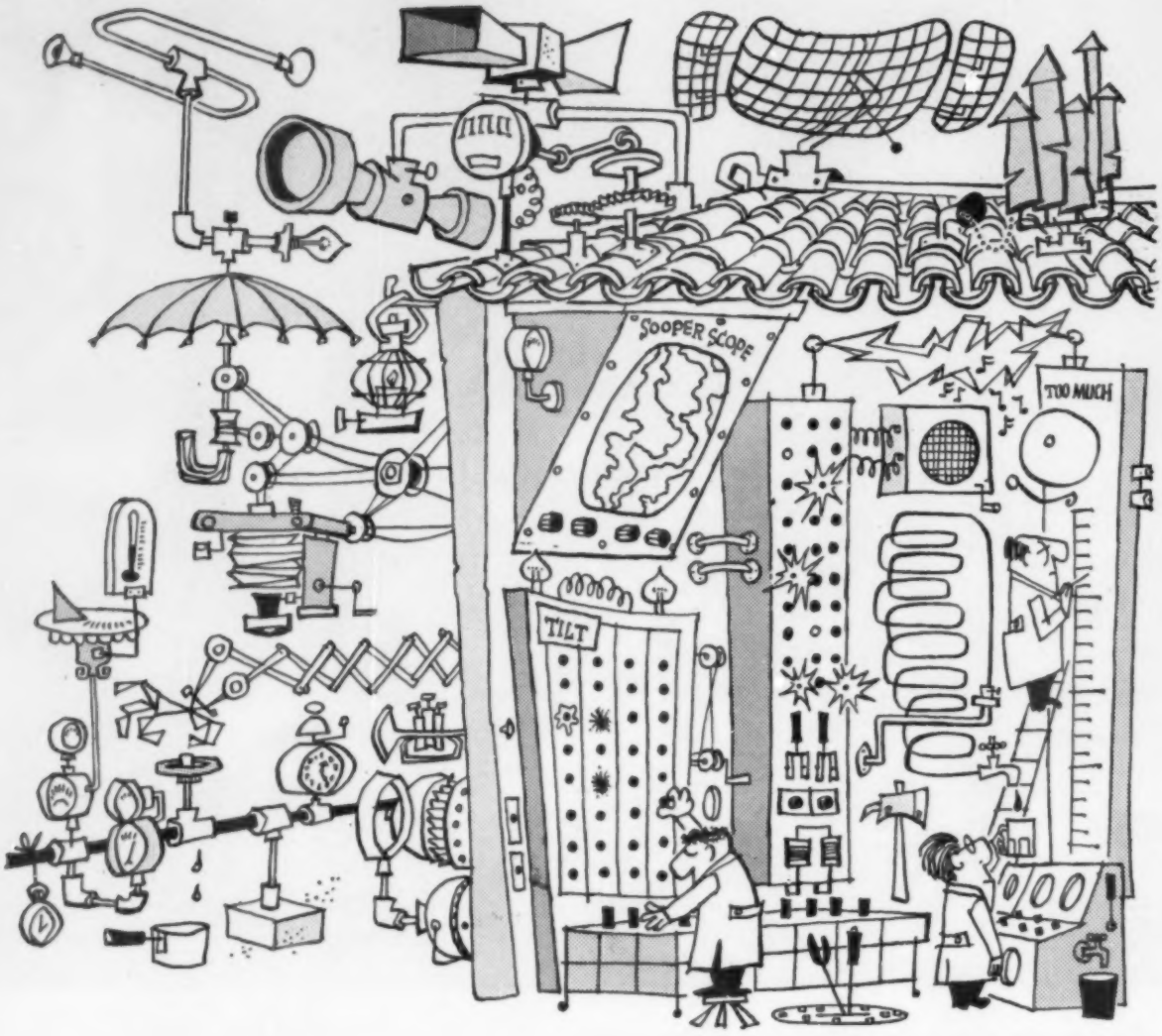

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Fig. 1

This solvent-treating method requires . . .

BY GENE KINNEY
Assistant Pipeline Editor

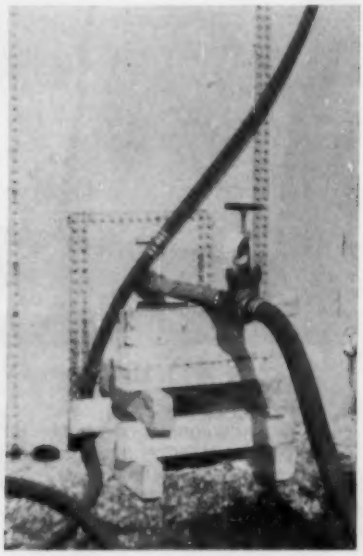
No shutdown to clean tanks

THE OLD HEADACHE of reclaiming tank bottoms is coming in for fresh attention with emphasis on methods which require no shutdown.

One approach to the problem of removing marketable oil from b.s. and w. is treating the heavy unpumpable bottoms with a hydrocarbon solvent, blending with fresh oil, and pumping the mixture into the pipeline stream. This is in contrast to mechanical cleaning involving opening the tank, plowing up and shoveling b.s. from the bottom, and disposing of it by heat treating, burning, giveaway, or sale where there is a market.

Solvent treating has been used for several years to clean out lease tanks, washing the producing formation, tubing, and flow lines. The solvent breaks down and suspends paraffin so that it can be handled in the crude stream without deposition. This method is being extended to storage tanks on

SCREW PUMP is selected for circulating unit operated by J. Elwood Newkirk, field engineer for the contractor. Solvent is injected on suction side. Fig. 2.



VACUUM HOSE is inserted to pump oil from tank at bottom. Fig. 3.

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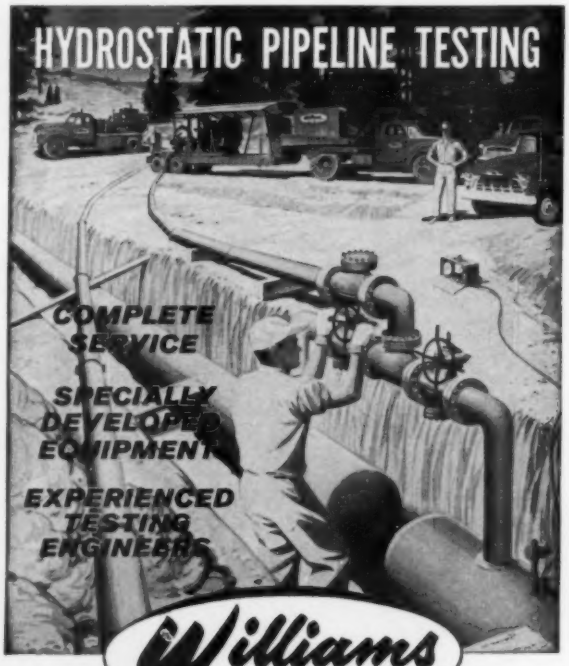

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AT TANK TOP oil is pumped into four-valve manifold with pressure-control by-pass. Fig. 4.

CIRCULATING HOSES from manifold feed pipe nozzles extending down gage hatch. Fig. 5.

trunk pipelines and at refineries. It was demonstrated recently in cleaning a 5,000-bbl. tank at Antioch, Okla.

The average initial b.s. and w. gage was 24⅜ in., or a volume of 428.81 bbl. After injection of about 120 gal. of solvent, and circulation of the solvent and oil for 23 hours, the average b.s. and w. gage was 8½ in., or 148.15 bbl. The amount of b.s. and w. reclaimed was 276.66 bbl. Circulation was stopped because of a winter storm which dropped oil temperatures, thereby reducing the effectiveness of the process, and caused dangerous working conditions on top of the tank.

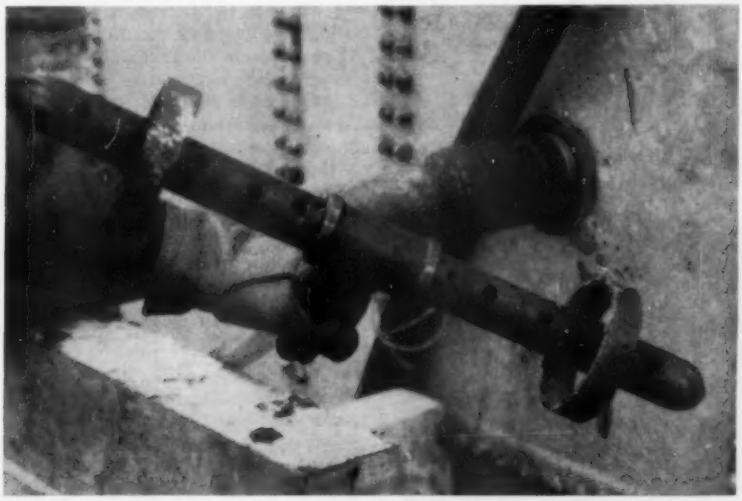
The cleaning operation was under supervision of Jack T. Newkirk, president of Para-Lax Corp.

Preparation for Cleaning

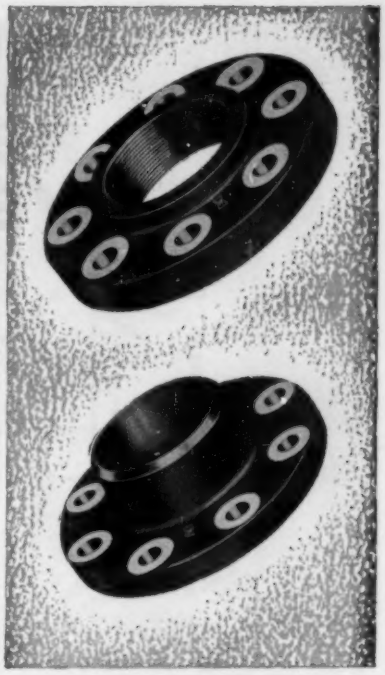
Before such a job is started representatives of the contractor and the tank owner measure the buildup on the bottom. Tank construction is examined to determine equipment required and special connections which may be needed.

The entire tank is sampled by thiefing all hatches, ladder ways, and by drag thiefing. Each sample is kept separate and individual tests are made for water, sand, paraffin, and general b.s. content. Another test is made with individual samples after they have been treated with solvent. Fresh oil from the tank is added to determine the ratio of blending.

For the Antioch job with 2 ft. of b.s. and w. in the tank, a 3:2 ratio of good oil to b.s. and w. was required before injection and circulation of solvent. The conditions dictated that a minimum oil level of 5 ft. be maintained during circulation.



TEE in which holes are drilled forms jet rake on end of arm extending from pipe nozzle. Fig. 6.



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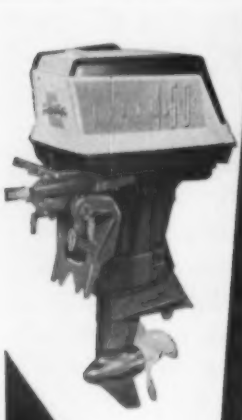

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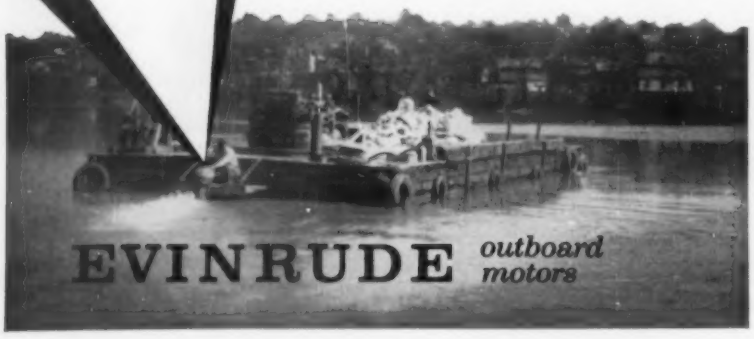

EVINRUDE outboard motors

Equipment and Procedures

The circulating unit was set up outside the fire wall (Fig. 1). The unit can be skid-mounted for permanent location if desired (Fig. 2). The pump selected for this service is a screw type designed to operate up to 860 r.p.m. with a capacity of 257 bbl. per hour. The pump is powered by a chain-driven 30-hp. engine with sparkproof magneto and sparkplugs.

The manifold contains one bypass to a sand or water trap or heater treater with both pressure and vacuum control and a return temperature indicator. The manifold has two vacuum chemical injectors. One has a vertical check valve and a sight feed for control blending. The other is mechanically operated fast feed and can be used as a vacuum cleaner for waste oil from the test bleeder. The direction of flow can be changed by another set of bypasses. These allow fresh oil to be brought over the top of the tank and fed into the intake at the bottom of the tank to help dig a cellar of free oil for circulation.

Oil is pumped from the tank through a 3-in. vacuum hose line inserted at the bottom (Fig. 3). Solvent is injected on the suction side of the pump. At Antioch, oil was pumped at 150 psi. and 225 bbl. per hour through 2-in. pipe and rubber hose into a four-valve manifold with a pressure-control bypass on top of the tank (Fig. 4).

From the manifold two circulating hoses led to 1-in. pipe nozzles which extended down one gage hatch to the tank bottom (Fig. 5). Another 1-in. hinged pipe nozzle was lowered down the other gage hatch. Attached to an arm extending at right angles was a 2-ft. tee in which holes were drilled to form a jet rake (Fig. 6). A rope was attached to the hinged arm for raising and lowering the nozzle.

Streams from the rake and the pipe nozzles were played over the entire bottom area to dig under the buildup, disperse the solvent, and mix the tank contents. Rakes are normally operated radially from the center manhole and the pipe nozzles are used separately. But a departure was necessary because the center manhole was closed by the center support pole on this tank.

Results and Applications

Conditions under which this tank was treated offered a stern test to the solvent-treating process. The contractor said that under normal weather conditions the bottom could have been completely cleaned of b.s. and w.

The method would be similar on larger tanks, with more pumps and greater volumes of solvent required.

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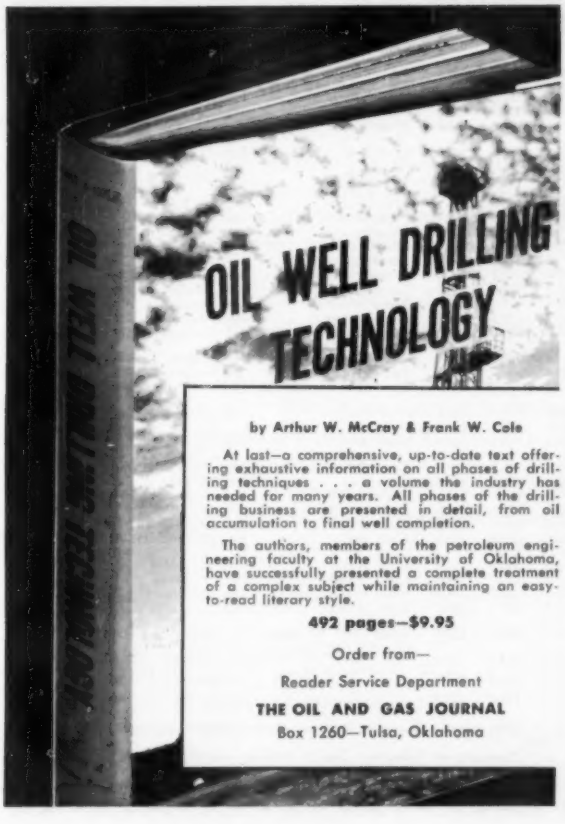

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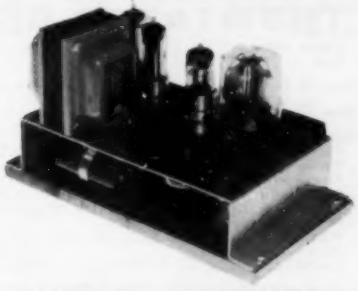

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Keep bottom-hole temperature anywhere you wish between 100° and 300° F. accurately to 1° F., supplying up to 45,000 B.t.u. to the bottom of the hole. Just dial the desired temperature at the surface control panel. Change it when you wish.

Install the Electromatic oil-well heater any place in the tubing string where you can obtain maximum recovery. The 35-ft. heating element is mounted on Standard API tubing. It fits any liner with a 4½-in. diameter or larger.

You can install the Electromatic Heater or remove it fast with handy Macdell quick-detachable self-aligning cable clamps.

Find out how you can increase oil recovery and eliminate heating problems with the Macdell Electromatic oil well heater. Send for free literature giving details.

MACDELL HEATER CO.

7215 BEVERLY BOULEVARD — LOS ANGELES 36, CALIF.
WEbster 4-9130 WEbster 8-9615

BY W. L. NELSON, Technical Editor and Petroleum Consultant

COSTimating

Itemized Cost Indexes

THE COST INDEXES may be used to convert prices at any date to prices at other dates by ratios of the cost indexes of the same date. Itemized indexes are published each quarter (first weekly issues of January, April, July, and October). In addition, the Nelson Construction Cost Index is published in the first issue each month of The Oil and Gas Journal.

	1949	1952	1954	1956	1958	Nov. 1958	References*	Index for earlier years (The Oil and Gas Journal) in Costimating and Questions on Technology issues
Operating costs (based on 1956 as 100.0):								
Power, electric, industrial	¶97.6	¶97.9	¶98.5	100.0	103.7	103.8	Code 540-03	
Fuel, residual	66.0	81.0	86.5	100.0	94.2	88.2		No. 4—Mar. 17, 1958
Gulf cargoes	69.5	78.3	85.9	100.0	102.9	93.5		No. 4—Mar. 17, 1958
N. Y. barges	69.6	84.9	82.6	100.0	93.0	85.9		No. 4—Mar. 17, 1958
S. Pedro bunkers	76.9	79.8	84.3	100.0	114.6	99.5		No. 4—Mar. 17, 1958
Oklahoma	51.2	57.1	62.0	100.0	66.3	73.9		No. 4—Mar. 17, 1958
Fuel, natural gas, wellhead	58.3	72.2	88.9	100.0	119.4	123.1	Code 531-01	
Industrial chemicals	80.1	95.0	96.9	100.0	101.8	101.9	Code 61	
Phosphoric acid	86.7	93.9	96.6	100.0	103.4	103.4	Code 611-07	
Sulfuric acid	76.1	89.5	100.0	100.0	100.0	100.0	Code 611-09	
Ammonia	104.8	94.6	103.0	100.0	103.8	101.8	Code 611-13	
Lime		87.7	92.0	100.0	104.4	104.0	Code 611-29	
Sodium carbonate	76.7	84.5	92.9	100.0	104.3	104.3	Code 611-65	
Sodium hydroxide	73.5	80.6	90.9	100.0	112.6	115.7	Code 611-69	
Sodium phosphate	85.3	92.0	95.5	100.0	104.6	104.6	Code 611-71	
Furfural		93.6	100.0	100.0	100.0	100.0	Code 612-63	
MEK, drums		94.5	94.5	100.0	106.9	106.9	Ch. & E. News	
Phenol		110.6	90.4	100.0	102.7	100.0	Code 612-83	
TEL	95.9	105.4	102.8	100.0	99.9	100.0	Supplier	
Operating labor (wages)	69.5	81.5	88.7	100.0	105.4	107.3	Employ. & Earn.	No. 55—Nov. 3, 1949
Productivity	85.5	90.2	97.1	100.0	100.3	105.0	Employ. & Earn.	Sept. 24, 1956§
Construction wages (1946 = 100):								
Skilled construction	133.9	157.9	174.6	187.3	205.1	208.7	Eng. News Record	No. 55—Nov. 3, 1949
Common labor	140.4	168.2	192.1	209.2	235.7	240.1	Eng. News Record	No. 55—Nov. 3, 1949
Refinery construction	137.1	163.1	183.3	198.2	220.4	224.4		No. 61—Dec. 15, 1949
Equipment or materials (1946 = 100):								
Arc-welding machinery	130.5	151.3	158.4	180.2	193.2	194.6	Code ‡1176	May 2, 1955§
Boilers, tanks, and sheet metal	†134.8	†153.4	147.3	168.0	175.1	175.8	Code 1072	Apr. 21, 1952§
Building materials (nonmetallic)	151.2	134.8	143.6	154.0	161.7	162.4	Code ‡13	No. 22—Mar. 17, 1949
Brick-building	127.7	140.6	144.7	159.2	162.4	163.3	Code 1341	No. 20—Mar. 3, 1949
Brick—fireclay	139.8	167.1	193.1	218.1	238.7	244.5	Code 1342	May 30, 1955§
Castings (foundry products)	150.5	168.0	181.1	204.7	227.2	229.1	Code 1015	No. 46—Sept. 1, 1949
Clay products (structural, etc.)	126.0	145.8	159.1	176.9	187.0	189.3	Code 134	No. 20—Mar. 3, 1949
Concrete—ingredients	123.7	132.7	142.1	153.3	163.2	163.3	Code 132	No. 22—Mar. 17, 1949
Concrete—products	121.7	132.6	138.5	144.9	151.0	151.0	Code 133	
Electrical machinery	130.9	152.4	159.9	175.0	192.7	193.3	Code ‡117	May 2, 1955§
Motors and generators	128.7	154.6	157.7	169.6	186.4	187.2	Code ‡1173	No. 31—May 19, 1949
Switchgear	132.3	161.4	171.2	194.9	218.8	218.1	Code ‡1175	May 2, 1955§
Transformers	129.7	148.0	161.9	175.4	187.3	188.1	Code ‡1174	No. 31—May 19, 1949
Engines (composite)	124.8	146.5	150.5	164.0	178.3	178.4	Code ‡1154	No. 36—June 23, 1949
Exchangers	133.0	165.8	¶171.7	¶190.7	181.2	175.8	Manufacturer	No. 2—Oct. 28, 1948
Copper base		175.3	¶190.7	198.8	168.8	166.6	Manufacturer	
Steel		152.3	¶156.8	178.6	190.0	184.4	Manufacturer	
Fans and blowers	152.2	183.7	192.6	222.4	241.7	243.3	Code 1147	Feb. 17, 1948§
Hand tools	134.0	155.1	173.8	200.3	224.7	227.8	Code 1042	June 27, 1955§
Instruments (composite)	123.1	146.2	154.6	182.1	194.9	197.0	Manufacturer	No. 34—June 9, 1949
Flowmeter (mechanical)	109.2	132.3	161.6	203.3	209.9	219.1	Manufacturer	No. 34—June 9, 1949
Flowmeter (air control)	132.4	160.5	179.6	203.9	216.3	223.5	Manufacturer	No. 34—June 9, 1949
Flowmeter (remote)	130.2	155.2	146.5	170.2	176.4	179.2	Manufacturer	No. 34—June 9, 1949
Potentiometer, 6-point	125.8	151.5	167.2	211.8	240.4	240.7	Manufacturer	No. 34—June 9, 1949
Potentiometer, air control	131.6	144.9	150.5	192.3	212.6	212.6	Manufacturer	No. 34—June 9, 1949
Pressure controller recorder	130.2	158.4	166.3	187.1	200.0	200.0	Manufacturer	No. 34—June 9, 1949
Pressure gage	100.0	108.6	108.6	119.2	119.2	119.2	Manufacturer	No. 34—June 9, 1949
Thermometer (recording)	118.6	149.4	152.8	170.2	179.7	179.7	Manufacturer	No. 34—June 9, 1949
Control valve	129.8	155.5	162.0	180.9	199.3	199.3	Manufacturer	No. 34—June 9, 1949
Lumber (composite)	165.3	203.2	197.8	214.5	198.9	202.7	Code 81	No. 7—Dec. 2, 1948
Southern pine	157.7	191.2	181.2	195.0	184.7	187.3	Code 812	No. 7—Dec. 2, 1948
Other soft woods	203.9	248.5	252.7	266.5	251.2	253.7	Code 813	No. 7—Dec. 2, 1948
Machinery—general purposes	131.9	151.8	159.9	183.8	199.6	201.5	Code 114	Feb. 17, 1949§
Machinery—construction	136.0	157.5	165.9	187.4	209.6	211.8	Code 112	
Machinery—oil-field	†132.9	†149.9	†161.9	†179.3	192.5	190.0	Code 1151	Oct. 10, 1955§
Paints—prepared	142.8	155.7	159.0	169.2	180.9	180.7	Code 621	May 16, 1955§
Pipe, sewer	†119.3	136.9	140.1	160.5	170.1	171.4	Code 1345	No. 22—Mar. 17, 1949
Pipe, black iron	152.2	179.0	195.0	233.0	264.8	263.8	Code 1014-56	No. 19—Oct. 15, 1956
Pipe, 6-in. line	†152.0	174.0	200.5	241.2	276.9	275.9	Code 1014-58	May 4, 1957§
Pumps, air compressors, etc.	135.9	155.6	166.5	192.0	214.7	222.0	Code ‡1141	No. 29—May 5, 1949
Steel (iron and steel)	143.3	168.5	179.6	209.0	228.2	232.6	Code 101	No. 61—Dec. 15, 1949
Steel—finished steel	173.8	170.0	187.1	212.4	240.6	244.8	Code 1014	July 25, 1955§
Plate	142.1	163.1	187.0	215.9	252.7	257.4	Code 1014-26	Mar. 4, 1957§
Structural shapes	151.2	176.2	193.4	219.1	262.8	268.4	Code ‡1014-31	No. 18—Feb. 17, 1949
Seamless tubes, 2-2¼ in.	140.9	168.8	199.4	235.5	277.5	285.1	Code 1014-61	Sept. 5, 1955§
Valves and fittings	†132.9	190.8	197.1	231.9	242.7	250.1	Code ‡1149 (10 items)	No. 46—Sept. 1, 1949
Nelson Refinery Construction (1946)	139.6	163.6	179.8	195.3	213.9	217.3		No. 61—Dec. 15, 1949
Nelson Ref. Operation (1956)	68.2	80.5	88.7	100.0	105.9	105.1		No. 2—Mar. 3, 1958
Nelson Ref. Process Oper. (1956)	71.3	82.2	88.4	100.0	105.8	104.5		No. 2—Mar. 3, 1958

*Code refers to the revised index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices."
†Estimated base value for 1946.

‡Not exactly the same items as those published before July 7, 1952.
§Questions on Technology, The Oil and Gas Journal. ¶Revised.

HYDROFINING REPLACES ACID TREATMENT

To eliminate pollution of air and effluent water, reduce operating costs, and to produce a sulphur free finished product, a large Gulf Coast refiner recently placed in operation the above pictured 6000 barrel per day HYDROFINING Unit designed to supplant acid treatment in processing close boiling range naphthas.

Feed stock is vaporized and mixed with hydrogen which catalytically reacts with sulphur contained in the feed stock mostly in the form of mercaptans, to form hydrogen sulphide which is further processed to recover elemental sulphur. After HYDROFINING the liquid product is washed with caustic and filtered through charcoal.

HUDSON furnished mechanical design, materials and equipment; and constructed the HYDROFINING Unit and the Fractionating Unit shown at the left of the picture.

The services of the HUDSON organization, with over 25 years experience in process design, mechanical design and construction are available to process industries in any part of the free world.

DESIGNERS AND CONSTRUCTORS OF PROCESS PLANTS FOR THE OIL, GAS, CHEMICAL, AND MINERAL INDUSTRIES

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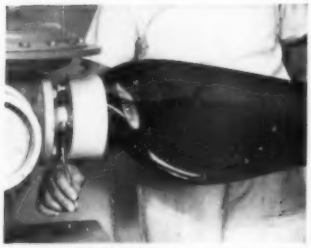
Lightweight.



Easy installation and adjustment.

NEW HUDSON TUF-LITE FANS

After six years of development work and tests of trial field installations operating under wide ranges of conditions in cooling towers, finned tube coolers, and in highly corrosive chemical plant ventilating service, Hudson presents a new product—the TUF-LITE fan. The blades, cast in one seamless piece of fiber glass reinforced synthetic resin, are hollow, light and tough. TUF-LITE fans afford the following advantages over any other available type of fan:

SAFE: TUF-LITE blades being lightweight (about ¼ the weight of other blades with comparable capacity) and infrangible, eliminate the hazards to personnel and equipment existent through accidental throwing or disintegration of heavy metal, wood, or laminated blades while in service.

EFFICIENT: More air is moved at less horsepower because weight and finishing operations do not impose limitations on selections of best aerodynamic design; therefore nearly ideal airfoil cross sections, commercially attainable only in TUF-LITE blades, can be used. Blades will not sag or distort, and surfaces remain permanently smooth.

LOW MAINTENANCE: TUF-LITE blades are unaffected by corrosive, abrasive or impingement effects of hot saturated air, sand, rain, or hail, and have superior deterioration resistance to practically all corrosive vapors or liquids. Blade materials contain color pigment; no painting is necessary. Light weight reduces stress and maintenance on bearings, gears, drive shafts, and supports.

QUIET: The permanently smooth surfaces, very light weight, sustained perfect balance, and advanced aerodynamic design minimize noise.

EASE IN INSTALLATION: Light weight of blades and ingenious design of hub and blade coupling allows attachment of blades by one man using only small wrench. Coupling design assures uniformity of pitch of all blades, and as blades of same size are identical and interchangeable, perfect fan balance is preassured.

In replacement of present fans or in installations on new cooling equipment of any manufacture TAKE ADVANTAGE OF THE OUTSTANDING SUPERIORITY OF HUDSON TUF-LITE FANS.

Bulletin on TUF-LITE FANS
Available upon Request

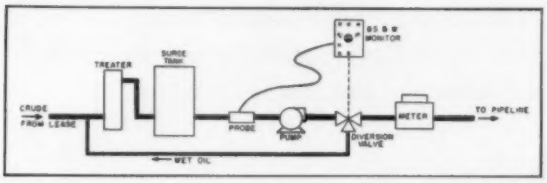
TUF-LITE protected by U.S. copyrights, patents and patents pending

HUDSON
ENGINEERING CORPORATION

FAIRVIEW STATION • HOUSTON, TEXAS

▶ ▶ ▶ New Equipment Section

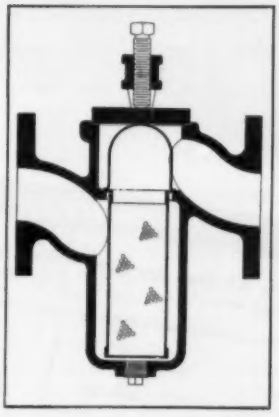
This week's SHOWCASE features . . .



B.s. and w. monitor for LACT systems

. . . automatically diverts oil for retreating when it's contaminated in excess of specifications. Known as Capalarm, the monitor is suited for other applications where capacitance varies enough to indicate off-normal product conditions.

The monitor is explosionproof, weatherproof, and operates from external power or battery. It's available in a wide variety of ranges, probes, and time delays. Accuracy is better than 1/10 of 1% water content. **Write or call: Fischer & Porter Co., 35 Jacksonville Road, Hatboro, Pa., for Capalarm b.s. and w. monitor details.**

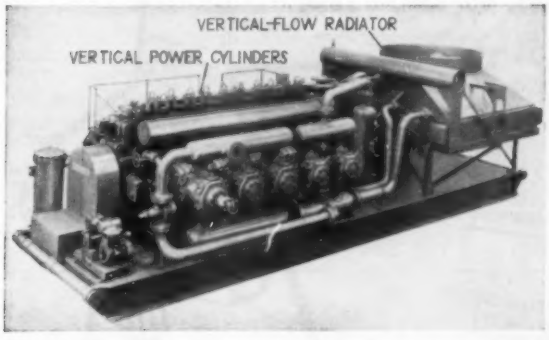


Single-basket pipeline strainer

. . . which offers low flow resistance and quick-cleaning advantages, is obtainable in 2, 2½, 3, 4, and 6-in. sizes, all with flanged connections. Rating is 125-psig. working pressure (cold). Cast iron is used for bodies and covers. A ductile-iron quick-opening cover clamp is provided on all sizes except the 6-in., which has a bolted-on cover.

The maker's standard basket construction is of stainless-steel plate with ⅛-in. perforations.

Sealing of the basket to the strainer body is accomplished with compressive force applied by the body cover through the basket handle. **Write or call: Schutte & Koerting Co., Dept. HT-H, Cornwells Heights, Bucks County, Pennsylvania, for Bulletin 9S-A.**



Packaged compressor is turbocharged

. . . and designed for field service in gas-lift, gathering, and similar use. The two-cycle Model TMB-8 compressor, with four compressor cylinders, is rated at 525 b.hp.

Horsepower output has been increased 20% over similar Clark non-turbocharged units. But loading on the power end of the machine is not increased. The scavenging load is removed when the compressor reaches rated load. Power formerly used for scavenging is used to pump gas.

The complete field-compressor package includes: (1) a gas-engine driven compressor, (2) radiator, (3) scrubbers, (4) starting-air compressor, (5) and other accessories. All are mounted on a steel skid.

Also available as a stationary unit, the compressor is built on a balanced-opposed principle. Scavenging cylinders are mounted on one side of the crankcase and compressor cylinders on the other. The scavenging cylinders are used primarily to furnish air at startup and for light loads. The inline power cylinders mount in a vertical position for easy accessibility. **Write or call: Clark Bros. Co., Olean, N. Y., for Bulletin 157.**

Send this Showcase Coupon

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

NAME AND/OR MODEL NUMBER.....

.....

Described in OIL AND GAS JOURNAL - Issue of April 6, 1959

NAME.....TITLE.....

COMPANY.....

ADDRESS.....

CITY.....STATE.....

Here's why no other rotary hose is "JUST AS GOOD" as GOODALL

There are many makes of rotary hose available today, but not one can measure up to the standards set by Goodall Rotary Hose. The Reason? Only Goodall hose has so many exclusive features. See for yourself! The following checklist will show you in an instant why no other rotary hose can match Goodall's pace-setting standards.

30-SECOND CHECKLIST FOR ROTARY HOSE BUYERS		
The Best Rotary Hose Made Must Have:	Use This Column To Rate Hose Other Than Goodall	Goodall Rotary Hose
Leak-proof coupling built right into the hose.		✓ (The revolutionary Barney Coupling always has a salvage value of $50.00 per set.)
Safety clamp that is an integral part of the hose.		✓ (Goodall's patented Safety Clamp cannot catch or constrict hose.)
Rugged hose construction that can take the highest burst pressure produced on any rig now in use.		✓ (Users report that Goodall Long-Life Hose eliminates 90% of rotary hose failures.)
Money-saving repair service whether damaged at the coupling or in the middle.		✓ (Goodall's Exclusive Repair Service can save you as much as $1,500 (a conservative estimate) each time you replace rotary and vibrator hose.)
Positive one-year guarantee.		✓ (Goodall's One-Year Warranty contains no limits on working pressures.)

Why not make your next rotary hose Goodall; you get greater value for each dollar spent when you do. Goodall Rotary Hose is available through your favorite oilfield supply store.

GOODALL RUBBER COMPANY

TRENTON, N. J.

Goodall Rubber Company of Texas: Houston and Odessa

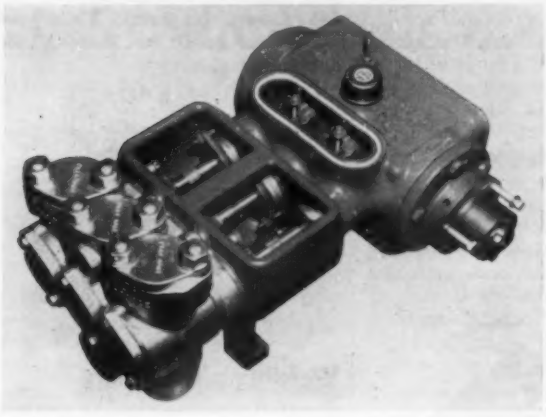
Goodall Rubber Company: New York, Philadelphia, Pittsburgh, Chicago, Denver, St. Paul, Detroit, San Francisco, Los Angeles, Seattle, Salt Lake City, Portland.

Export: Goodall Rubber Company, Trenton, N. J.

Stocking Distributors: Texas and Louisiana — Houston Oil Field Material Co., Wilson Supply Co., Hunt Tool Co., Heap Equipment Company, Iverson Supply Co., Lee Franks, Wichita Falls, Texas.

Available through all qualified supply stores.

New Equipment



DESIGNED for use in salt-water disposal . . .

Triplex plunger type of pump

. . . just announced is rated at 14 hp. and has a 1¾-in. stroke. Four interchangeable plungers permit the Model P-175 pump to be used to produce volumes to 936 bbl. a day and pressures to 1,780 psi.

The pump incorporates several noteworthy fluid and power-end design features. These include: (1) straight fluid-flow design; (2) nylon-fitted valves; (3) one-piece cylinder-head stuffing box; (4) prelubricated packing; (5) offset crankshaft; and (6) gravity-flow lubricating system.

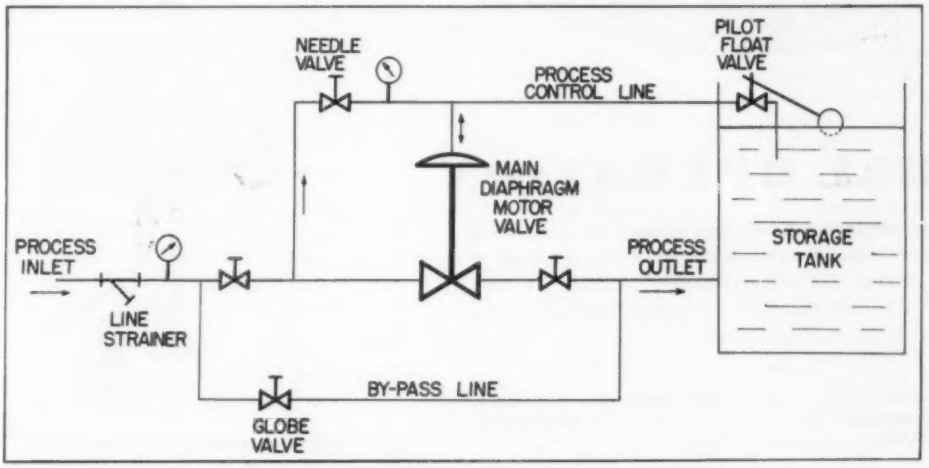
The pump measures 27⅜ by 21¾ by 12⅞-in. and weighs 395 lb. **Write or call: Frank Wheatley Pump & Valve Mfgr., P. O. Box 1948, Tulsa, for details on Model P-175 power-plunger pump.**

Metering pump is compact

. . . and the components are guarded by a safety shield. Suited for processing, corrosion control, four models of the Masterline pump are obtainable. Capacities range from 1 to 1,030 gal. an hour per feed.

A foot-mounted motor powers the pump. To simplify replacement, the speed reducer is kept separate from the motor. At full stroke, the connecting rod's angularity is only 5° from the axis of the plunger.

Optional for the pump is equipment to permit manual or automatic stroke adjustment while the pump operates. Some components are interchangeable among the different sizes of the pump. **Write or call: Hills-McCanna Co., 4600 West Touhy Avenue, Chicago 46, for details on Masterline metering pump.**



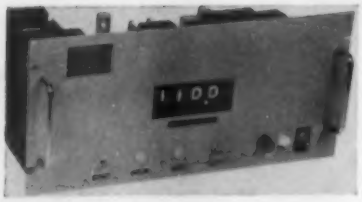
Operated by line pressure and using sliding-gate-and-plate regulator . . .

Liquid-level system gives accurate control at high rates

THE system is designed around an OPW diaphragm valve that is available in sizes from ¼ through 6 in. It provides capacities from 1 to 2,300 g.p.m., depending upon the pressure difference.

A needle valve and pilot float valve are used to pilot the control valve. The system is expected to find use where critical liquid-level control is needed. It is designed to minimize the controls needed.

Pressure and temperature ratings of the motor valve are: bronze, 250 psi., 406° F.; cast iron, 125 psi., 450° F. The valve is direct acting (normally open) with pressure exerted on the dome to close the main valve. **Write or call: OPW-Jordan, 6013 Wiehe Road, Cincinnati 13, for Bulletins SRB 2-59 and J-170.**



Capacitance type of gage

. . . measures solid or liquid level. In the Model 0358-1 liquid-level gage, the height of the material produces a change in capacitance which is measured by a self-balancing bridge so that the readout is shaft rotation of a servo rebalance. The circuit employed makes the measurement virtually free of lead-length errors.

The gage is suitable for a wide range of electrically conductive liquids and granular solids. The gaging method is capable of a range of forms and applications. In one system design, it is possible to connect a number of probes parallel.

In another arrangement, the gage can be set up with an automatic selector switch to make a series of measurements and, by the use of a shaft encoder, print a continuous log of the readings. The basic bridge and readout unit measures 7 by 19 by 13 in. weighs 35 lb., and operates from 115-volt, 60-cycle power. **Write or call: Magnetic Instruments Co., Inc., 546 Commerce Street, Thornwood, N. Y., for details on Model 0358-1 liquid level gage.**

●

Welding-pipe fitting

. . . offers a strong, efficient means of making branch outlets on high-yield pipe. The fitting, trade-named Bonney Sweepolet, is a forged, integrally reinforced, insert-butt type which, according to the maker: (1) assures maximum efficiency of metal placement with minimum weld; (2) assures optimum distribution of stresses due to both internal pressure and externally imposed loads; and (3) takes less time to install and costs less than other comparable quality fittings on high-yield pipe. **Write or call: Bonney Forge & Tool Works, Allentown, Pa., for details on Bonney Sweepolet.**

●

New electric-hoist models

. . . extend the Lodestar capacity range to 2 tons and double the lifting speeds available in ½ to 1-ton sizes.

Model R has a capacity of 2 tons and a lifting speed of 8 ft. per minute. Model L's capacity is 1 ton at 16 ft. per minute, and Model J, with ½-ton capacity, has a speed of 32 ft. per minute. **Write or call: Chisholm-Moore Hoist Division, Tonawanda, N. Y., for details on Lodestar electric hoists.**

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A challenge to every drilling contractor . . .

Don't Read This Unless You Want to Save Thousands of Dollars

You have the right to know the facts about slush pump drives . . . is a chain drive better than gear drive?

Let's take weight for example: Because a chain and sprocket is about half the width of a gear of equal torque capacity, and hence is lighter in weight and less costly than a gear. This also reduces the width of the entire pump and further reduces the weight.

And how about shock loads? If the bearings on the pinion shaft and crank shaft are in the outer frame of the pump, the "spring" in the pinion shaft and the crank shaft plus the "stretch" in the chain, will cushion shocks that would break the teeth out of gears. Hence it is more able to withstand shock loads without injury, that would break a gear.

Safety link that's built in: The chain provides a "built-in safety link," like a fuse in an electric circuit, that prevents damage to more expensive parts, and yet has ample capacity to transmit all normal loads within the rating of the pump, with a good factor of safety.

Strength is important, too: In a gear drive only one or two teeth are carrying the entire load (in a helical, or herring-bone gear, it would be a short length of several teeth, approximately equal to two teeth in a spur gear) whereas in a chain and sprocket drive many teeth are sharing the load. In the Wilson Titan Pump a minimum of five teeth in each of the three rows of very large teeth, or a total of fifteen teeth are carrying the load at all times, and these teeth are flame hardened to resist wear. (The wear on teeth that have been running for four years is negligible!)

Do you know about "sliding action"? When the gears run together under load as in a mud pump drive, *a sliding action takes place between the teeth* that might be called a "scouring action." Under heavy load this tends to rub small flakes of metal off the teeth, particularly if there is even the slightest bit of sand or grit in the lubricant. When these metal flakes get in the oil they are carried back again into the gear teeth, where they intensify the wearing process, until it is not long before the gears are completely worn out. And in some pumps this same oil is used to lubricate the bearings, and of course either sand or metal flakes are highly destructive to either plain or anti-friction bearings. In the Wilson Chain Drive Mud Pump *no sliding action, only a rolling action takes place between the sprockets and the chain!* And all oil is filtered.

Main sprocket, crank, and one-piece connecting rods.

Now there's the question of breakage: In a gear driven pump the failure of either of the pinion shaft bearings or either of the crank shaft main bearings will let these shafts separate on that end, and this will throw all of the gear load on the teeth on the opposite side. This will usually cause one or more of the teeth in the gear or pinion to break out, and when these break out they will pile up between the remaining good teeth and create a tremendous force tending to force these shafts apart. This then destroys the pinion (which is usually cut solid from the pinion shaft forging, and is very expensive) as well as the very expensive gear, and often crushes all crank shaft and pinion shaft bearings, and in many cases practically destroys the entire power end.

In a chain driven pump, *the only part that can break is the chain itself.* And if it should break it simply falls down on the large sprocket and does no other injury. And it can be replaced with a new chain at a cost of *less than 10%* of the cost of the gears only in a gear pump; and the damaged links of the old chain can usually be replaced at a cost of 10 to 20% of the cost of a new chain. So the repair cost is only 1 to 2% as much as the repair cost of a gear driven pump!

What does downtime cost? If breakage in the power end of a gear driven pump does occur it usually means days or even weeks of "down time" and many thousands of dollars of expense!

If the same thing should happen to a chain drive pump it simply means the replacement of the chain which can be done in the field in about the same time it takes to replace a rod or piston. And the *cost is trivial compared* to gears! (Wilson makes a practice of carrying a spare chain in stock at the nearest parts depot, which is usually within about an hour's drive from your pump).

Compare efficiency losses: A chain drive is much more efficient than a gear drive. In the heavy gears such as used in a mud pump it is usual to use up 5% or more in friction in the gear when the gears are new, and it is not at all unusual to lose 10%, 15% or even more of the available horsepower in friction loss when the gear becomes worn.

In a chain drive pump the loss is only about 2%; and it retains this efficiency over a long period of time.

Reliability points to the chain drive: Various other types of drives have been tried on the other rig drives; the compound, transmission and drum drives, etc. Gears have been tried in the transmission and discarded. No other type of drive has proved its reliability as has the multi strand roller chain. The *gears inside the pump are the only gears in a modern rig drive system.* It stands to reason that if a roller chain is best for all the other drives, it is also best inside the pump!

Wilson revolutionary chain drive means no gears . . . no gear troubles.

To make up your mind take a look at cost per H.P.: What counts is the *cost per horsepower* of actual pump capacity, at the maximum speed it can operate successfully. The average actual cost per horsepower of all twelve larger pumps is $60.10 per H.P. The cost of the Wilson Titan is $40.20 per H.P.; almost exactly two thirds. And the average cost of all fourteen smaller pumps is $66.66 per horsepower, while the cost of the Wilson Giant is $43.50 per horsepower, which is nearly 35% less!

Our customers are reporting savings up to $1500.00 on a 6000-ft. well.

Why not take advantage of these savings yourself? Write or phone for details of our trial pump offer.

John W. Wilson

WILSON MANUFACTURING COMPANY

Wilson

WICHITA FALLS, TEXAS

Mr. M. B. Riordan, Vice President
B. J. Service, Inc., Long Beach, Calif., says:

"Low curb weight, price and maintenance deciding factors in our preference for

"We've owned Ford Trucks for almost eleven years and find Ford's low curb weight means bigger loads for us. Our Ford T-800's haul up to 1800 lb. more payload than other trucks of comparable size.

"We've been in the oil well business for 31 years supplying the materials, personnel and equipment to do a complete oil well servicing job. We operate 365 days a year and 24 hours a day. With $25,000-$30,000 tied up in each rig, we could lose money fast if our trucks weren't reliable. We feel our Fords do an outstanding job.

"You can't beat Ford in value, either! Not only is Ford's initial price low but we get three years of hard, rough use out of our Ford Trucks before we trade. That way we keep our costs 'way down.

"Maintenance costs are very reasonable, too. Not only are Ford Trucks easier to overhaul but parts costs are lower—our profit and loss statement proved that to us! And we can get Ford parts anywhere we operate. That's important in our kind of work because it's essential we stay on the job once we are started."

costs have been

Ford trucks"

GO FORDWARD for savings

FORD TRUCKS COST LESS

LESS TO OWN... LESS TO RUN... LAST LONGER, TOO!

NOW!
CERTIFIED PROOF
FORD TRUCKS
COST LESS

All tests conducted and results
CERTIFIED
by America's foremost independent automotive research organization*
*NAME AVAILABLE ON REQUEST
Send inquiry to: P.O. Box 2687 Ford Division, Ford Motor Co. Detroit 31, Michigan

'59 Ford Pickups Win Economy Showdown U.S.A.

—average 25.2% better gas mileage!

Impartial tests of the 1959 pickup models of all six makes prove conclusively that Ford's ½-ton pickups equipped with Short Stroke Sixes are the economy champs for '59.

HOW TESTS WERE MADE

Standard six-cylinder models of the six leading half-ton pickups first were put through exhaustive road trials. All '59 trucks—Ford and competitive—were bought from dealers, just as you would buy them. After at least 600 miles break-in, all were brought up to manufacturer's recommended specifications.

The trucks were then tested—by America's leading independent automotive testing firm—at constant speeds of 30, 45 and 60 miles an hour. Next came stop-and-go tests, ranging from moderate city traffic to normal retail delivery operation. Acceleration rates were carefully timed in each gear to insure accurate results for all makes.

HOW NEW '59 SIXES RATE IN GAS MILEAGE						
'59 FORD SIXES GIVE	25.2% more miles per gallon than Make "C"	31.1% more miles per gallon than Make "I"	9.6% more miles per gallon than Make "G"	42.6% more miles per gallon than Make "D"	22.0% more miles per gallon than Make "5"	25.2% more miles per gallon than the average of all makes

The '59 Ford Sixes, *in every test*, averaged more miles per gallon than every other make! Combining all tests, the '59 Fords led the average of all other '59 pickups by 25.2%.

WHAT'S THE SECRET?

How can a '59 Ford Six make four gallons do the work of five in other trucks?

First, of all pickup Sixes, only Ford has modern Short Stroke design. This new type of engine is basically far more efficient than long-stroke Sixes of other pickups. Example: Ford's Six delivers more usable horsepower than any other pickup Six.

Second, to this modern engine Ford has added a new economy carburetor. By metering fuel more precisely in both low- and high-speed ranges, Ford's new carburetor boosts gasoline mileage in every type of driving. And Ford's *Economy Carburetor* is *standard at no extra cost.*

Your Ford Dealer now has the complete report of Economy Showdown U.S.A. Why not call or visit him today and get the whole story firsthand?

WHERE IS THIS MUD GAUGE?

One fact is certain: It is on the drilling rig of an experienced operator. This one happens to be off the coast of Louisiana. It could be in any oil producing area, however, because Cameron pressure gauges are found almost everywhere oil is found. Highly abrasive drilling mud under extreme pulsating pressure will wreck an ordinary gauge in short order. But the self-contained diaphragm of the Cameron gauge prevents line fluids from entering the gauge mechanism. A unique dampening mechanism gives uniformly steady pressure readings without the usual violent fluctuations of conventional gauges. For offshore work Cameron pressure gauges are furnished with bronze cases. Standard models will handle mud, water, oil, air, and gas. Special models are available for almost any service, including corrosives. If pressure readings are a problem, COUNT ON CAMERON.

Cameron
IRON WORKS, Inc.
P. O. Box 1212-Houston, Texas
Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., 76 Grosvenor St., London W. 1, England

SHOWCASE . . .

New Literature

Instrument, control-switch bulletin

. . . discusses switch construction features and advantages in eight pages. Bulletin 14B8112B notes that the switches were designed for use with circuit breakers, transformer tap changers, motor-operated rheostats, instruments, and many other types of electrically controlled apparatus. The bulletin gives applications, dimensions, and photographs of the products, and includes a dismantling section which shows you component parts. **Write or call: Allis-Chalmers Mfg. Co., 1126 South Seventieth Street, Milwaukee 1, for Bulletin 14B8112B.**

New diesel engine brochure

. . . gives power ratings and over-all dimensions on more than 100 in-line, "V" and turbopower models. The 12-page publication includes fan-to-flywheel and base-mounted power units to power or repower practically any type of industrial, construction, or petroleum equipment. The brochure illustrates single, multiple, and turbo-powered units ranging from 20 to 1,654 hp. in only three cylinder sizes. It also features engines which provide efficient, compact, and lightweight diesel power in the 20 to 195-hp. range. **Write or call: Detroit Diesel Engine Div., General Motors Corp., Detroit 28, for All-Purpose Power-Line brochure.**

Pumping-unit selection guide

. . . features four tabular charts of pumping-unit data which simplify selection of units for most any pumping condition. Charts include units in 96 specifications and 14 API sizes with structure ratings of 3,200 to 32,400 lb. Eight-page Bulletin 488-A includes photos, advantages, and nomenclature of various pumping units. **Write or call: National Supply Co., Two Gateway Center, Pittsburgh 22, for Bulletin 488-A.**

Fluid-proportioning pump

. . . called Model 1140 Proportioneers Adjust-O-Feeder is detailed in new obtainable Bulletin 1140.20A-1. The four-page bulletin features explanatory text, photos, and cutaways showing the new fluid-end construction and check valves. It includes a detailed capacity chart with pressure ratings, specifications, and dimensions intended to help you select the correct pump for the viscosity of fluid to be proportioned. **Write or call: B-I-F Industries, Inc., 345 Harris Avenue, Providence 1, R.I., for Bulletin 1140.-20A-1.**

Preventive-maintenance products

. . . and services designed especially for petroleum refineries are detailed in a new 96-page catalog. The scope of products and services covers coatings for corrosion prevention, ranging from subzero to temperatures in excess of 2,000° F. The catalog deals with such additional subjects as refractory-protective coatings, chemical-water treatments, solvent-cleaning methods, soot, firescale, and slag eradicators, and chemical treatments for combustion and refining cycles. **Write or call: Xzit Chemical Co., 158 Fourteenth Street, Hoboken, N.J., for Preventive-Maintenance Products and Services for Petroleum Refineries catalog.**

Valve information is abundant

. . . in new 20-page Bulletin KS1-M. It contains up-to-date data on cast-steel gate, globe, angle, and swing-check valves for refinery and industrial use. The bulletin includes parts ordering information, trim material, recommended services, and a handy figure-number index designed for rapid reference. **Write or call: Kerotest Mfg. Co., 2525 Liberty Avenue, Pittsburgh 22, for Bulletin KS1-M.**

Engine-driven generating equipment

. . . is covered in four new pocket-sized pamphlets which deal with the equipments' electrical and technical characteristics. The pamphlets, written in easy-to-understand language, deal with: (1) description of excitation methods; (2) comparison of operation running hours between an electric generating-plant engine and the average automobile engine; (3) discussion of various engine fuels; and (4) discussion of the operation of electric motor loads with revolving field-generating plants. **Write or call: D. W. Onan & Sons, Inc., 3628 University Avenue, S.E., Minneapolis 14, for Power Talks Pamphlets M-100 through M-103.**

Forged-steel-union bulletin

. . . provides detailed specification data on all types, sizes, materials, and pressure ratings. Bulletin U-2-58 points out application advantages and features of drop-forged unions. The eight-page bulletin shows how O-ring

flange unions and tongue and groove-flange unions have been streamlined to do away with overlapping of both two and four-bolt types. According to the bulletin, this assures adequate coverage with fewer sizes. **Write or call: Forge & Fittings Div., W-S Fittings Works, H. K. Porter Co., Inc., P. O. Box 95, Roselle, N. J., for Bulletin U-2-58.**

Twelve air-motor models

. . . which range from 11½ to 20 hp. with output shaft speeds of from 19 to 800 r.p.m. at rated horsepower are detailed in a new bulletin. The 12-page publication gives complete specifications, dimension drawings, torque and horsepower curves, throttle variations, and a cutaway illustration. **Write or call: Joy Mfg. Co., Oliver Building, Pittsburgh 22, for Air-Motors bulletin.**

Gas analyzers which use Orsat

. . . method are detailed in new 12-page Bulletin 55-668-27. The Orsat gas-measuring method generally has been accepted as the standard of accuracy in industrial and scientific work since 1874. Its reliability is established by the fact that other methods of measuring gases are checked with an Orsat. The bulletin gives complete information and specifications on more than 85 different gas-analyzer models. **Write or call: Hays Corp., 742 East Eighth Street, Michigan City 1b, Ind., for Bulletin 55-668-27.**

Aluminum mill-products brochure

. . . gives complete specifications for hundreds of alloys and forms of aluminum, and promises to help you pinpoint specific properties and apply them accurately to the desired end use. The 18-page brochure describes alloy and temper designations, fatigue and shearing strengths, various alloys available in foil, sheet, plate, wire, rod, bar, tubing, pipe, and extruded and structural shapes. It also summarizes fabricating and finishing techniques. **Write or call: Reynolds Metals Corp., Dept. PRD-1, P.O. Box 2346, Richmond, Va., for Aluminum Mill-Products brochure.**

Dry-test gas meters

. . . are featured in new Bulletin 500 which provides detailed information on: (1) tinned steel-case meters with totalizing indexes; (2) the Charcoal test meter; (3) tinned steel-case meters with hourly rate dial; and (4) iron-case and aluminum-case meters with totalizing indexes. The meters were designed primarily for measuring gas unsaturated with water vapor and for field or lab testing where portability and large capacity is required. **Write or call: American Meter Co., Advertising Dept., 920 Payne Avenue, Erie, Pa., for Bulletin 500.**

Sampling bob gives accurate

. . . information on liquid contents in bulk storage as described in new two-page Bulletin 500-13-0. The sampling bob consists of a plastic or brass cylinder with butterfly valves at the top and bottom. The bulletin gives operation data, accuracy, construction, and photos. **Write or call: Johnson & Jennings Co., 6917 Bessemer Avenue, Cleveland 27, for Bulletin 500-13-0.**

OVERHAUL & REPAIR

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Experienced aircraft and engine craftsmen, armed with the best and latest tools and testing equipment, speed your work through modern shops with care and precision. We do everything from repairing a door handle to rebuilding air frames and engines. A complete line of spares and accessories eliminate delay. We are now serving oil companies and private aircraft owners throughout the U. S. and in many foreign countries.

DOWNTOWN Airpark

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EMPIRE SAND SAMPLE ENVELOPES

Specially designed and manufactured for storing sand samples. They will last and serve for years. Immediate delivery of any quantity.

PRICES AND SAMPLES ON REQUEST

32= KRAFT RUSTPROOF FLEXIBLE METAL TIE

CORE BOXES

Corrugated and solid Kraft Fiber Boxes for storing sand samples.

Core Boxes built to specifications.

TULSA PAPER COMPANY

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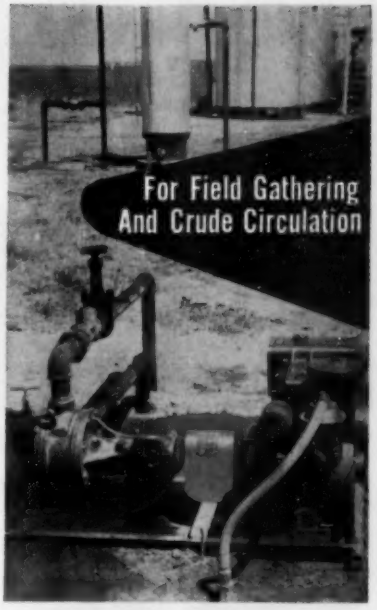
P. O. BOX 38 TULSA 1, OKLA.



VIKING PUMPS

with Positive Action

The positive suction of Viking rotary pump action makes it possible to draw from one or several tanks. Delivery can also be made to one or more tanks.

This versatility makes the Viking Pump applicable to any arrangement of gathering tanks, treaters and separators.

Heavy-duty Viking Pump construction lends itself to many mounting and power arrangements.

For information on this complete line of Viking Pumps, send today for catalog CT

VIKING PUMP CO.

CEDAR FALLS, IOWA, U.S.A.

In Canada, it's "ROTO-KING" pumps

See Our Exhibit, Booth 57, California Building, International Petroleum Exposition, May 14-23, Tulsa, Oklahoma.

Lee Manning is appointed

. . . a field representative at Axelson Division of U. S. Industries, Inc., reports L. G. Evans, vice president in charge of sales. He will headquarter at Glendive, Mont. Manning previously worked for Axelson as a field representative in the Powell, Wyo., area before leaving the company in 1947.

Gardner-Denver Co. observes

. . . the oil industry's 100th anniversary as the company—which grew up with the industry—traces back 100 years.

Robert W. Gardner, a Scottish immigrant engineer, founded Gardner Governor Co. the same year Col. Drake made his strike at Titusville, Pa. In his one-room foundry and machine shop at Quincy, Ill., Gardner and his son began the manufacture of the Scot's invention—a fly-wheel governor that would control the speed of steam engines.

R. W. Gardner

G. V. Leece

It was the Spindletop strike in 1901 that gave birth to Gardner Governor Co.'s Petroleum Division. When Spindletop oil came gushing in, demand for equipment was urgent. Eastern manufacturers were hard put to meet delivery dates. Gardner was not.

The Great Depression of 1894 had raised company steam-pump inventories. Wanting to keep his men working, Robert Gardner kept producing and storing his stock in all available space. Spindletop came in just as the attic rafters were creaking in Quincy.

In 1927 Gardner's firm merged with Denver Rock Drill Mfg. Co. and the newly formed company began the manufacture of more modern drills, bigger air compressors, and more powerful pumps.

The company today, under the leadership of Gifford V. Leece, president, has matured with the petroleum industry and the challenges presented by its rapid growth. On the eve of its centennial in 1958, Gardner-Denver emphasized this trend by acquiring the Mayhew Machine and Mayhew Supply companies of Dallas.

Today's Gardner-Denver company has 13 plants in four countries and 47 offices supplying equipment around the world. Headquarters remain at Quincy, Ill.—along the Mississippi river banks—where Gardner made the first governor for the old "Long John" steam engine 100 years ago.

Shreveport Division wins sales awards

J. L. McBRIDE, left, manager of Halliburton Oil Well Cementing Co.'s Shreveport Division, holds one of two trophies presented by the company for his division's 1958 sales accomplishments.

McBride's division posted the best sales increase on a percentage basis and also won the race for the best sales volume of floating equipment. This marked the first time one division won both awards, reported Grover Kilgore, Howco's vice president in charge of sales and advertising. The Shreveport Division competed against the company's 11 other domestic divisions.

Pictured with McBride at a Shreveport dinner meeting are, from left, Ed Trapp, sales manager, Duncan, Okla.; Edwin L. Paramore, vice president of the southern region which includes Shreveport; Harry P. Conroy, vice president in charge of field operations, Duncan; and Joe Clark, assistant division manager, Shreveport.

Twenty-five guests attended the meeting, the first of a series for the division's employes in Louisiana, Arkansas, and Mississippi.

Newton E. Armstrong is named

. . . manager of Systems Development Division of Southwestern Industrial Electronics Co. Formerly product manager of SIE's Control Division, Armstrong's job now includes the development and production of devices, instruments, and systems for control applications. Before joining the company 3 years ago, Armstrong was with International Business Machines Corp. in Endicott, N. Y.

F. W. (Bud) Muller is appointed

. . . vice president and general sales manager of Gustin-Bacon Mfg. Co., Kansas City, Mo. For the past 20 years Muller has been active in all phases of the insulation industry —manufacturing, research, sales, contracting, and marketing. Prior to joining Gustin-Bacon in 1954, he was sales manager of Calumet Hecla Mining Co.

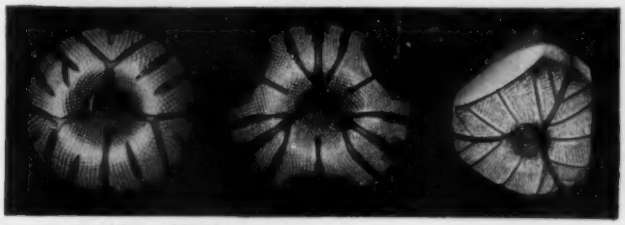
Moore, Norman establish

. . . Geophysical Exploration Co., with offices in Houston and Lafayette, La.

With the exception of 4 years, R. R. Moore has spent his entire professional career in the geophysical field. He has been a field-party man, instrument operator, computer, party chief, and su-

D&S First in . . .

1947 1952 1956



Diamond Drilling

EVOLUTION

Spearheaded by D&S--TRUCO

During the past 10 years many new principles have evolved to change the design and performance of diamond drilling and coring bits. Through this era the industry has looked to D&S for leadership.

With the introduction of the now famous TRI-DIA bits, D&S scored a major industry advance. Now, through research D&S brings you the all new TRI-Y jet action diamond drill bit . . . custom designed to give faster penetration, eliminate re-grinding center, last longer and give more overall rig savings.

WRITE OR CALL TODAY! Your D&S sales engineers will call on you and explain this revolutionary new Diamond Bit.

TRI-Y Standard recommended for extremely hard abrasive formations. Reduced Face TRI-Y recommended for sands, shales under pressure compaction.

TRUCO DIAMOND BITS

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OFFICES IN ALL PRINCIPAL OIL AREAS

Ultra Fine Diamond Equipment for the Oilfield

Drilling & Service INC.

World-Wide in Scope — Local in Know How and Service

pervisor. Robert Norman's experience runs the gamut from field-party man to supervisor.

H. U. Garrett acquires assets

. . . of McFarland Mfg. Corp., Houston, manufacturers of air, gas, and fluid-operated chemical injectors,

H. U. Garrett

C. A. Polk

transfer pumps, proportioners, and hydrostatic-testing units.

At the time of purchase, the corporate name was changed to McFarland Mfg. Co. Garrett takes over as president and Clarke A. Polk continues as vice president.

Garrett founded Garrett Oil Tools in 1946 and served as president of the firm until last year, when he was elected a vice president of U. S. Industries, Inc. He resigned from that position this year.

W-K-M to erect "bubble house"

. . . for exhibiting products at the upcoming International Petroleum Exposition.

The plasticized fabric "air structure" will be kept inflated by a constant low-pressure source of air. Translucent skin will glow by night and admit light during daytime.

Product displays inside the dome-shaped structure will feature explanations tape recorded in English, Spanish, French, and German. Guests, expected from 50 foreign countries, need only select a labeled handset for product information.

W-K-M is a division of ACF Industries, Inc.

Cargo carrier pulls trailer loaded with 12 tons of iron

. . . test weights through a foot of snow in a field test at Clintonville, Wis. The vehicle—called Teracruzer—is one of two built by FWD Corp. for use in Standard-Vacuum Oil Co.'s East Pakistan oil exploration.

J. Virgil Moore is appointed

. . . first vice president in charge of engineering and sales of Daniel Orifice Fitting Co. The appointment came from company stockholders at the annual meeting held recently in Houston.

J. V. Moore

Other officers named include: William A. Griffin, Jr., chairman of the board and president; John W. Whalen, second vice president in charge of manufacturing; Malcolm J. Bell, secretary-treasurer; and Alphonsine Ring, assistant secretary.

Moore and Griffin were also named directors for the year, along with Glenn W. Daniel, Mrs. June G. Daniel, and Joseph G. Holdenried.

Technical Oil Tools Corp. adds

. . . two new members—John Sowers and William L. Brannon—to its field-service organization. The announcement comes from John P. Davis, general sales manager.

John Sowers

W. L. Brannon

Sowers, formerly employed by Hughes Tool Co., will represent Totco in the Bakersfield-San Joaquin-Northern California area. Brannon is the company's new export representative.

W. C. Norris opens branch

. . . warehouse at Edmonton, Alberta, under the supervision of Bill C. Robinson, Canadian division manager. Otto R. Perryman was named warehouse manager. W. C. Norris Mfgr. is a division of Dover Corp., Tulsa.

B. C. Robinson

Collapse resistance of casing

. . . is tested on this new unit placed in operation at Jones & Laughlin Steel Corp.'s Aliquippa, Pa., works. The testing unit is capable of exerting collapse pressures up to 25,000 psi. and can test all sizes and strengths of casing from 4½ through 10¾-in. o.d.

Rubber seals are placed on both ends of the casing sample before it is put in the pressure vessel. Next, a threaded closure (shown at left) is rotated into place to seal the chamber.

The entire operation is remotely controlled. An operator looks through the window (top right) of steel enclosure when the test is in progress.

▶ ▶ ▶ Among the Drilling Contractors

Tool Pusher's Manual

"The Toolpusher's Manual," a comprehensive technical volume designed for "on-the-job" use by superintendents of oil-well drilling rigs in the field has been produced by the AAODC. The manual contains more than 500 pages of technical information ranging from bits and pipe, to wire rope which is classified and indexed in alphabetical order. It is loose-leaf bound to permit substitution of data and inclusion of new information. It is printed on Texoprint, a plastic-coated and impregnated paper which resists molds, moisture, bugs, and dirt and can be cleaned easily.

"Recognizing the great responsibilities placed on the tool pusher, the American Association of Oilwell Drilling Contractors has given considerable thought to the development of this manual so that the tool pusher may have much technical information at his fingertips," B. E. Groenwold, president of the Midland Exploration Co. and chairman of the rotary-drilling committee of AAODC, explains in his introduction to the manual which is dedicated to the tool pushers.

Another feature of the book is that each page is die-cut and index-tabbed for quicker reference. Space is provided to permit entries in the manual applying to specific jobs and conditions. The association plans to publish another edition next year.

Further information regarding the manual can be obtained from AAODC, 534 Insurometic Bldg., Dallas.

California AAODC fetes new officers

The Los Angeles chapter of American Association of Oilwell Drilling Contractors met with its new national officers in the Los Angeles Petroleum Club recently. Joe Zeppa, president of the national association and president of Delta Drilling Co., Longview, Tex., reviewed the current drilling situation and made some realistic predictions. Also present was Warren Baker, national executive vice president of AAODC and former oil publication executive. Baker was optimistic in his forecast, stating that reduction in imports will probably have a beneficial affect on the domestic drilling situation. Some 60 California drilling contractors were present.

Calvert plans big drilling program

Twenty-five to thirty wells will be drilled in gas areas of northwestern Oklahoma by Calvert Drilling Co., Inc.

F. A. Calvert, Jr., president, said approximately $1,000,000 of proceeds from a common-stock sale recently concluded will be used to develop properties in Harper, Major, Alfalfa, Grant, Dewey, and Kingfisher counties. Calvert will retain a one-fourth or less interest in most of the wells.

The company has drilled six wildcat gas discoveries the last year. It owns 5,850 net acres and 13 net offset locations near these wells. Four rigs capable of 12,500-ft. depths have been purchased.

Canamerican busy at Rocanville

A rig of Canamerican Drilling, Ltd., Calgary, Alta., is being kept busy on a six-well drilling program Devon-Palmer Oils, Ltd., and Seventy-Six Development Co. have undertaken in the Rocanville area of southeastern Saskatchewan Province, western Canada.

Locations of the wells are on farmouts Devon-Palmer and Seventy-Six have from California Standard Co. and Tidewater Oil Co. involving leases totalling 4,160 acres. Wells are projected to depths of 2,700 to 3,000 ft. to test the Bakka formation. All are wildcats.

Camdrill in Libya

Camdrill International, Inc., has tied down two more drilling contracts for work in Libya. The Southern California Petroleum Corp. subsidiary has already started on a program with a light Ideco rig for Oasis Oil Co. in Tripolitania Province of the North African country. The second contract is with Libyan-American Oil Co. on a large concession in the same general area.

Camdrill for 2 years has served as drilling contractor for Mobil Oil and Esso Standard operations in Libya. Scott A. Murray is in charge of all Camdrill operations in Libya. Ernest Pierotti is general drilling superintendent.

Ard Drilling Co., Abilene, Tex., is keeping a rig busy in deep-drilling operations in multiple-pay Bakke field. Shown on a well location being drilled for Woodley Petroleum Co. are, left to right: N. Silkwood, Ard drilling superintendent; "Red" Weise, driller; J. Scroggins, M. M. Presley, and D. M. Gaines, crewmen; and Joe Stewart, tool pusher. The field, in Andrews County, was discovered in 1958. New drilling is to depths below 12,000 ft. This picture was inadvertently run in the March 9 issue with a wrong caption.

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*This message has previously appeared in the various journals. Responses proved that it was timely and factual to the extent that it should be repeated.

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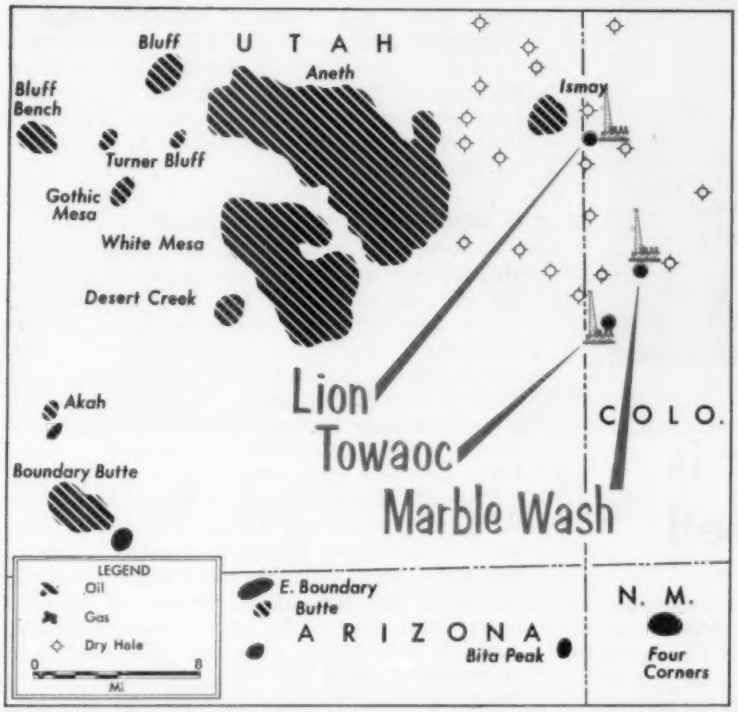


TWO EXCELLENT DISCOVERIES of Paradox oil have projected Colorado squarely into the Paradox basin play. Texaco's Towaoc field strike, coupled with a more recent one by Lion, will stimulate a lagging search in the southeastern part of the basin.

Twin finds push Paradox across Colorado line

BY FRANK J. GARDNER

AFTER A SLOW discovery year in 1958, the Paradox basin is off to a much better year in 1959. Only one new field was found there last year. March 1959 will go into the books as a milestone in Paradox development, however. Two excellent strikes were made, and big Paradox oil surged across the Utah state line into Colorado for the first time. Both discoveries lie in Montezuma County, less than 2 miles from the Utah border.

Actually, the first Paradox oil well in Colorado was the discovery at Marble Wash field, but it pumped only 38 bbl. of oil and 24 bbl. of water per day; this was The California Co. 2 Calco-Superior-Ute Tribal (Section 15-33½n-20w) completed in 1958, also in Montezuma County. This was 3 miles east of the Utah line.

Over the line . . . But the real spillover came last month when The Texas Co. finished its 1 Ute Mountain Tribal (Section 21-33½n-20w) for a flow of 1,236 bbl. per day as the discovery well of Towaoc field. This was only 2 miles southwest of Marble Wash field; there are no dry holes between the two wells. Production is from the Paradox at 5,830-85 ft., approximately the same level as Marble Wash. There has been no drilling for a distance of 5 miles south of the Towaoc strike, but a quartet of dry holes lies northwest of it (see map).

Now comes news of the second big discovery for Montezuma County. This is Lion Oil Co. (Monsanto) 1 Retherford - Government, in Section 15-35n-20w, 8 miles north of Towaoc. The operators have reported a flow of 20 bbl. per hour in early testing at this discovery. The first test was conducted in an interval at 5,820-99 ft., with the tool open 30 minutes. Gas came to the surface in 3 minutes, mud in 25, and oil in 28. Productive zone is Pennsylvanian in age and included part of the Bluff pay and part of the Ismay-Paradox (topped at 5,878 ft.) On a second drill-stem test in the Ismay at 5,901-38 ft., the well again gave up 20-30 bbl. of oil per hour. This was a 2-hour and 28-minute test; gas surfaced in 5 minutes and the oil flow came in 2 hours and 23 minutes.

The discovery is on a farmout from Gulf Oil Corp. and is almost surrounded by dry holes. Lack of failures between it and Ismay field, however, has led to conjecture that it may extend Ismay across the state line.

After so long a time . . . Colorado has long stood quietly by, waiting for these discoveries to happen. Utah has so far grabbed all the glory as far as the Paradox success was concerned. But operators in the region have always felt that sooner or later, the play would move to the east. Many wildcats have been drilled on the Colorado side, and many of them had good showings of oil or gas, but only a handful have indicated commercial pools. Now the picture changes and western Colorado is firmly in the Paradox spotlight.

We can look for a rash of new drilling aimed at these Paradox pays during the spring and summer months. Already, Sinclair Oil & Gas Co. has started two new wildcats about 2 miles east of the Towaoc discovery. These are the 1 Ute-2 in Section 23-33½n-20w, and the 2 Ute-2 in Section 25-33½n-20w. Undoubtedly there will be more locations announced for the Lion discovery area as well.

Of the two new discoveries, the Towaoc probably has the edge, as far as major development is concerned. More than 50 sections of land lie undrilled to the west, southwest, south, and east of it. The Lion discovery, on the other hand, is fairly well confined. The vagaries of the Paradox pay, however, preclude any early predictions about the future course of development. Remember that only 3 years ago, the entire area covered by the map above was a complete blank oilwise.

Forgotten corner is being remembered

BIGGEST OIL NEWS in the Paradox basin since Aneth itself is the discovery of oil at a Montezuma County wildcat in southwestern Colorado. This opens first commercial production in a bypassed part of the basin. This long-needed strike plus big drilling plans for Arizona, and a fast-moving shallow play in New Mexico's Horseshoe Canyon field places the Four Corners as top contender for exploratory news this spring.

Years of scattered drilling

. . . paid off at The Texas Co.'s 1 Ute Mountain Tribal wildcat in southwestern Colorado, paving the way for a renewed look into this part of the Paradox basin. Texaco's big well flowed 1,236 bbl. of oil per day from Hermosa-Pennsylvanian perforations at 5,850-55 ft., opening Towaoc field. This is the best oil find yet in Colorado's corner of the fickle Paradox. Location is southwest of last year's small Marble wash find and southeast of the giant Aneth fields of Utah.

Texaco's important hit should spur Pennsylvanian exploration in southwestern Colorado. Look for new tests to this formation in the coming months. General Petroleum Corp. reports shows of gas in the Pennsylvanian at its 10,000-ft. wildcat northeast of Red Mesa field in LaPlata County. We may have more such news soon from a now **unforgotten** corner of one of the biggest oil basins in the nation.

Arizona's promised big wildcat year

. . . may get off its lagging feet this spring. An impressive array of wildcat locations is on the maps in scattered sections of this desert state. Both the Holbrook and Black Mesa basins are slated for wildcat scrutiny. Pan American Petroleum Corp. will drill four wildcats in the Flagstaff-Winslow-Holbrook area; Monsanto Chemical Co. will drill at Chevelon Creek in Coconino County; Freeman Lomelino will drill in Navajo County on the Penzance Dome; Mae Belcher is drilling in Apache's Springerville area; and Shell Oil Co. will drill south of Boundary Butte field in Apache County's Black Mesa basin. The Shell well is less than 1 mile southeast of Humble Oil & Refining Co.'s big 562-bbl. well at East Boundary Butte, Arizona's first commercial oil discovery.

A shallow Cretaceous giant

. . . is stealing the current drilling show in New Mexico's San Juan basin. Operators are making fast hole and getting good wells in both Gallup and Tocito zones at Horseshoe Canyon field. Atlantic Refining Co. and El Paso Natural Gas Co. holds the reins in this race. Atlantic alone has put down more than 20 wells in the past few months. Drilling is easy, the rewards are high—100-bbl. wells or more. Proved acreage in the field has zoomed to about 6,000 acres with more than 80 wells in the coffer.

Atlantic recently completed what is believed to be a linkup well between Horseshoe Canyon's Gallup reservoir and Verde Gallup field about 2½ miles northeast. Verde field has no Tocito production, but boasts 100 Gallup wells. Of the two pays, the lower Tocito zone is the more attractive. Reserve estimates by some give oil in place in the Gallup at Horseshoe at about 500 bbl. per acre-foot; in the Tocito at about 900 to 1,000 bbl. per acre-foot.

The new Tocito and Gallup hunt in the San Juan basin coupled with the already brisk Dakota Cretaceous push in the Gallegos-Bisti trends marks northwestern New Mexico for some busy development days ahead.

Large exploratory agendas

. . . loom in the northwestern portion of the Anadarko basin and in Wyoming's Green River basin. At least 50 wells are planned in the next 3 years in the Panhandles-Colorado-New Mexico-Kansas province. Belfer Natural Gas Co. plans 35 wells in Green River's Big Piney area.

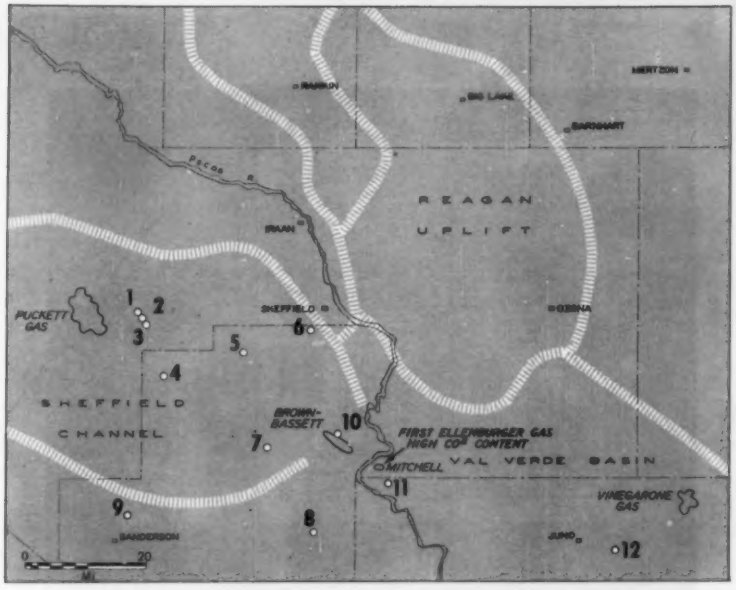
Dixie oil-hunters

. . . **expect deeper drilling** in North Louisiana and South Arkansas to get a boost as a result of Jackson-Cheyenne Oil Co.'s prolific Smackover Jurassic strike at Haynesville. This well flowed 726 bbl. of oil per day, making it one of North Louisiana's best Smackover wells yet.

. . . **see a continued spread** of South Mississippi's Tuscaloosa sand revival. A new find by Marshall R. Young in eastern Franklin County moved West Lincoln Tuscaloosa field more than 2 miles west. Daily flow was 300 bbl.

. . . **may see Florida get back** into the wildcat panorama soon. Two significant tests are already under way. Sun Oil Co. is drilling in Gadsden County; Gulf Oil Corp. is digging offshore from Monroe County near Key West. There are rumors of more wildcats stirring.

—John C. McCaslin.



THE DRILL BIT is sinking deep into Texas soil along the Pecos River as oil men eye a dozen sites in three West Texas counties. The 12 drill sites are detailed at bottom left.

BY CARL HOOT
District Editor

West Texas drillers go deep

1 Pecos County: Standard Oil Co. of Texas 1-29 Fred P. Montgomery, to 14,000 ft. Located 18 miles southwest of Bakersfield on 322-acre lease, in Sec. 28, Blk. 120, T&STL Sur. Drilling below 3,410 ft. Delta Drilling Co. rig.

2 Pecos County: Standard of Texas 1-28 Fred P. Montgomery, to 14,000 ft. Located 18 miles southwest of Bakersfield on 644-acre lease, in Sec. 28, Blk. 120, T&STL Sur. In location stage.

3 Pecos County: Standard of Texas 1 Fred P. Montgomery, to 14,000 ft., on 640-acre lease in Sec. 33, Blk. 127, T&STL Sur. Drilling below 12,740 ft.

4 Terrell County: Pan American Petroleum Corp. 1 Ethel Corder, Sec. 30, Blk. 2, CCSD&RGNG Sur., to 16,000 ft. Located 34 miles south of Bakersfield on 5,320-acre lease. Total depth 13,471 ft. at last report. No nearby production and no nearby dry holes. Rowan Drilling Co. rig.

5 Terrell County: Ohio Oil Co. 1-TA Ohio-Pure-University, Sec. 14, Blk. 37, University Lands Sur., to 16,000 ft. Located 16 miles southwest of Sheffield, on a 640-acre lease. On ground elevation of 2,500 ft., topped Pennsylvanian Strawn at 10,575 ft., drilling below 11,194 ft. A. W. Thompson Drilling Co. rig.

6 Terrell County: Shell Oil Co. and Humble Oil & Refining Co. 1 J. E. Smith, to 12,000 ft. Located 4½ miles southwest of Sheffield, on 634-acre lease, in Sec. 5, Blk. A-2, TCRR Sur. Drilling below 3,555 ft. Corbett Drilling Co. rig.

7 Terrell County: Gulf Oil Corp. 1 R. W. Prosser, to 15,200 ft. Located 24 miles northeast of Dryden, on 25,560-acre lease, in Sec. 45, Blk. 1, TCRR Sur. Total depth 11,390 ft. at last report. Great Western Drilling Co. rig.

8 Terrell County: Great Western Drilling Co., Blue Danube Oil Co. and Ben Harwit 1 Chapman Ranch, to 15,000 ft. Located 12 miles south of Brown-Bassett area, on 4,480-acre lease, in Sec. 64, Blk. Y, TCRR Sur. Drilling below 10,054 ft.

9 Terrell County: Gulf Oil Corp. 1 Beulah McCue et al., to 14,200 ft. Located 40 miles southwest of Brown-Bassett area, 4½ miles northeast of Sanderson, on 640-acre lease, in Sec. 9, Blk. R-2, GC&SF Sur. Drilling below 7,352 ft. Falcon-Seaboard Drilling Co. rig.

10 Terrell County: Magnolia Petroleum Co. 2 Goode estate, to 14,800 ft. Located 1 mile northwest of production, on northeast flank of Brown-Bassett field. Drilling below 5,195 ft.

11 Val Verde County: Humble Oil and Refining Co. 1 J. B. Malone Ranch, to 15,000 ft. Located about 5 miles southeast of Sun 1 Mitchell, in Sec. 9, Blk. Q-5, TCRR Sur.

12 Val Verde County: Shell Oil Co. 1 B. E. Wilson, to 16,000 ft. Located 7½ miles southeast of Juno, 12 miles southwest of Vinegarone gas field. Drilling below 7,281 ft. Wesly Young Drilling Co. rig.

ELEVEN going down and one making ready—that's the drilling picture in West Texas' hottest area for deep exploration.

This drilling play covers portions of Pecos, Terrell, and Val Verde counties, and involves three separate geological features — the Sheffield channel, Pandale anticline, and Val Verde basin.

Present activity was accelerated by the discovery of Silurian and Ellenburger gas in 1957 at Brown-Bassett field in northeastern Terrell County. Original production at Brown-Bassett was on the Goode Ranch, where in 1931 Ohio Oil Co. found gas in the Pennsylvanian at 5,606 ft.

When Magnolia Petroleum Co. and Western Natural Gas Co. found gas production in both the Silurian and Ellenburger, operators called the strike the most significant in years for West Texas. And like Puckett gas field to the northwest, the big-structure inspiration for all explorers, Brown-Bassett's Ellenburger relief was around 1,500 ft.

Present status of Brown-Bassett's deep production is 6 gas completions. One well is being drilled to the Ellenburger, and one to the Pennsylvanian. Growth of the field, in almost a one-well line from northwest to southeast, has extended gas production approximately 2½ miles in both directions from the field's original deep discovery. While two of the wells have been dual completions, the Fusselman (Silurian) has not been productive in all wells.

A lot of exploration work has been done in the Val Verde basin, and especially along its northwestern flank,

by Humble, Shell, and Sun. Sun Oil Co. 1 Myrtle Mitchell, located in the southwestern tip of Crockett County, was the first indication of deep production in the area. This was a 1953 discovery, and on the Pandale structure.

No. 1 Mitchell had a fishing job which halted drilling at 14,958 ft., still in the Ellenburger. It had top of the Ellenburger at 13,750 ft., giving it a net section of 1,208 ft., of which 599 ft. was logged as pay. It was completed from a small section of the Ellenburger for 4,300 M.c.f. of gas, of which 42% was carbon dioxide. Sun shut the well in for lack of market or outlet.

When the wells shown on the accompanying map have been drilled, a lot of guess-work will have been taken out of the following features:

The channel . . . Sheffield channel is generally described as a buried connecting link (in Pennsylvanian time) between Delaware basin to the northwest, and Val Verde basin to the southeast.

Pandale anticline . . . This is a huge, faulted anti-clinal structure trending northwest-southeast. Its size increases with depth, and its closure has been estimated at 2,000-3,000 ft.

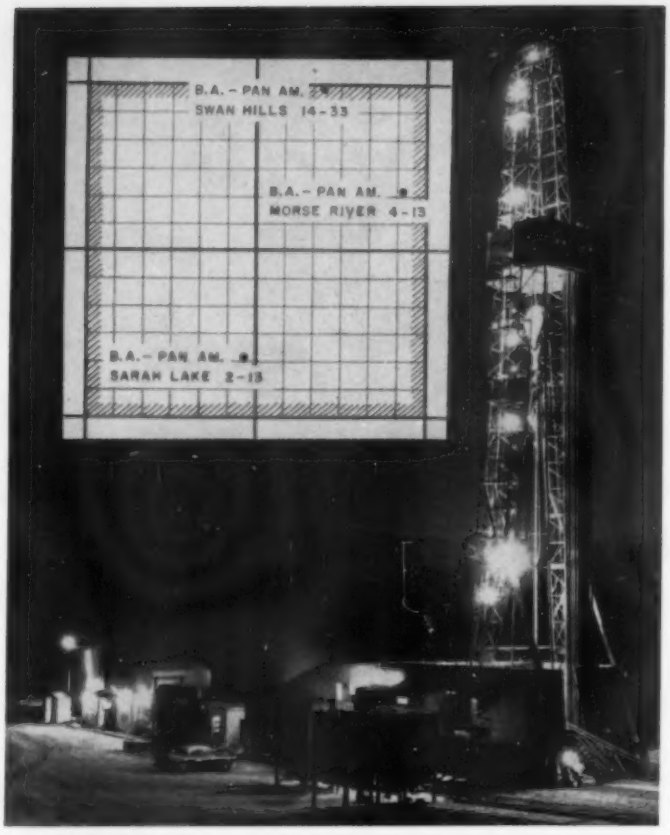
Val Verde basin . . . This is a big sedimentary basin, lying some 50 miles southeast of the Permian basin, on a northwest-southeast trend. It takes in more than half of Val Verde County. It extends over the southwestern corner of Sutton County, and the western edge of Edwards County. Its deepest portion is around 16,000 ft., in approximately the upper center of the county. Geologists have long held that the basin offers big gas possibilities.

Gas condensate is hit in Louisiana's Lafayette

Rich gas-condensate production is being opened by Continental Oil Co. in the Maurice-Melton area, 10 miles north of Abbeville in northern Vermilion Parish, Louisiana Gulf Coast. It is near the Lafayette Parish line.

Conoco's discovery well, 1 Clemile Savoy, in 43-11s-4e, is productive at 14,675-95 ft. after being drilled to 16,054 ft. It flowed at the rate of 648 bbl. of 46.4°-gravity condensate and 8 M.M.c.f.d. of gas with pressure of 6,400 psi.

Location is a mile southeast of gas-condensate production at Maurice on a block of 5,255 acres. Seaboard Oil Co. and Charles B. Wrightsman own 25% interest each in the block.



Drilling Rig at work in the prolific Swan Hills area of Alberta on the jointly held British American-Pan American reservation where three significant discoveries recently have been made. Initial potential was 2,568 bbl. a day for the 14-33 Swan Hills well and 242 bbl. a day from the 4-13 Morse River well. The most recent well, 2-13 Sarah Lake, flowed 695 bbl. a day during a drill-stem test. The 92,160-acre reservation, which covers four townships approximately 115 miles northwest of Edmonton, was purchased in July 1957. (Photo courtesy British American Oil Co., Ltd.)

California test

North Tejon field's main area was given its first dual completion by Reserve Oil & Gas Co. with a well in NW NW 20-11n-19w on the south edge of the area. The Reserve well, 312-20 "BW-T" was completed in an upper zone selectively perforated at 11,323-75 ft., 11,403-93 ft., 11,497-11,535 ft. and 11,555-95 ft. and in the lower zone at 11,599-11,734 ft. Initial production from the upper zone was 661 bbl. daily of 38.2°-gravity crude through a 24/64-in. choke. The lower zone was making 277 bbl. daily 36.4°-gravity crude through a 14/64-in. choke.

Webster Parish gets Rodessa pay

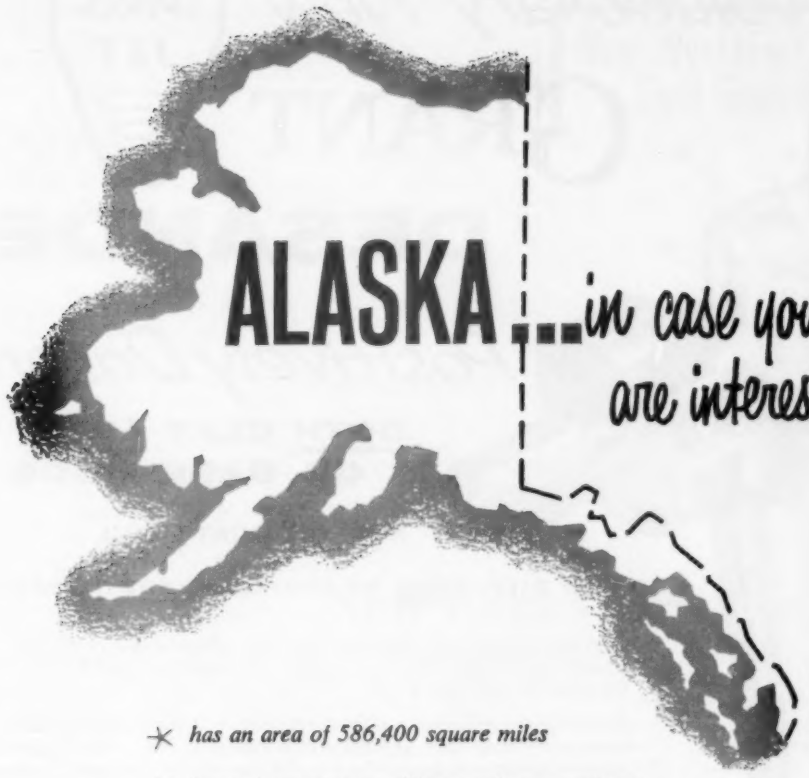
RODESSA is joining Paluxy as a known productive horizon on the Minden salt dome, in Webster Parish, located in North Louisiana.

First Rodessa production at Minden is in Pan American Petroleum Corp.'s newly completed 1 Walker, in 19-19n-8w, about 2½ miles east of Minden townsite.

The well is dually completed with oil production from Rodessa sand at 6,462-88 ft., and gas-condensate production from the deeper James lime at 6,841-54 ft. The field's three previously completed wells are productive from the shallower Paluxy formation.

Production from the Rodessa sand was at the rate of 56 bbl. of 13.4°-gravity oil per day through 24/64-in. choke. Flowing pressure was 497 psi., and gas-oil ratio 50 cu. ft. per day. James lime produced 3,146 M.c.f. of gas and 73 bbl. of 65.7°-gravity condensate per day through 14/64-in. choke with pressure of 2,542 psi.

Minden's discovery well was completed 2 years ago as Louisiana's first



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- *was discovered by a Dane, Vitus Bering, in 1741*
- *has a 6,640-mile coastline*
- *has, as its approximate geographic center, a point in latitude 63° 46', longitude 152° 20'*
- *has produced some oil since the early 1900's*
- *has, as its state flower, the Forget-me-not,*

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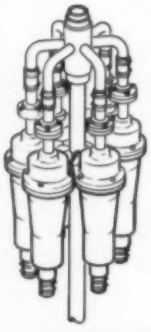

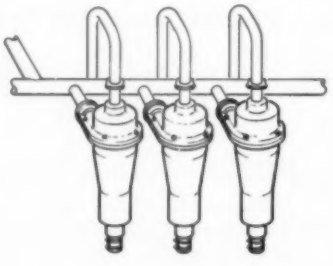

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commercial production on any of its inland salt domes. Two of the field's Paluxy wells are gas productive. The other is a dual-zone oil producer.

Wyoming prepares for spring drilling

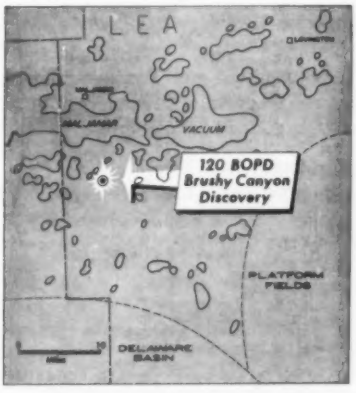
Spring drilling in Wyoming promises to be widespread and brisk. Nearly every corner of the state will see action.

In the Green River basin the Dry Piney Unit got another gasser at Belfer Natural Gas Co.'s 4 DPU, NW SE 10-27n-114w. Frontier gas flowed at the daily rate of 3,355 M.c.f. It is a 1½-mile northeast stepout to the field, and is the fifth well to be drilled here. The well is due to go on down to Nugget at 11,000 ft.

Belfer has staked a 11,000-ft. Frontier test at Emigrant Springs in Lincoln County. Caulkins Oil Co. will drill to Nugget at a wildcat about 1 mile southeast of Little Worm Creek field in Sweetwater County.

In the southern end of the Red Desert basin Phillips Petroleum Co. announced a 15,000-ft. Nugget wildcat at South Baggs in Carbon County. This field produces from Fort Union, Lewis, and Wasatch.

Nugget is the center of attraction in the Wind River basin, also. First offset to new pay production at Winkleman Dome, the Nugget was completed by Pan American Petroleum Corp. Two other wells are drilling and testing this zone in the field.



WORKOVER brings in flowing well. Harvey Yates, Artesia, N. M., went into a twice-deepened well 12 miles southeast of Maljamar in Lea County, and completed it as a Brushy Canyon (Delaware) discovery. No. 1 Sweeney-Federal, in 25-18s-32e, flowed 120 bbl. of oil a day through 14/64-in. choke from pay at 8,651-55 ft. Old total depth was 9,593 ft. Location is 2 miles southeast of Querecho Plains field.

WESTERN KENTUCKY'S Muhlenberg County is seeing plenty of action. A new field is developing northwest of Greenville.

New field stirs at Greenville

THE WESTERN KENTUCKY portion of the Illinois basin is stirring.

A 13-well new field is developing in the area 4 miles northwest of Greenville in Muhlenberg County. Production is from Paint Creek, Benois (Bethel), and O'Hara, all Mississippian pay zones.

The discovery well in this new field was completed last summer at Creek Oil Co. 1 Ray Vincent in 5-I-28. It pumped 154 bbl. of oil per day, natural, from Paint Creek sand at 1,885-70½ ft. Now there are 13 good wells in the field. Most of them make up to 200 bbl. per day from the three pays. Half a dozen active locations promise further development this spring.

Two fields spark N. W. Oklahoma news

GOOD OIL STRIKES dominate current drilling news in northwestern Oklahoma. Two fields are the focal points of this development, Northeast Cheyenne Valley and North Catesby.

Major County's Northeast Cheyenne Valley, one of the best oil finds in this portion of Oklahoma, added another good well. Cities Service Oil Co. completed 1 Keegan in C NW NE 5-21n-14w, flowing 112 bbl. of 41°-gravity oil in 3½ hours on 20/64-in. choke from Cherokee-Pennsylvanian perforations at 6,879-91 and 6,897-6,916 ft. The daily flow was 770 bbl. with gas-oil ratio at 469:1.

North Catesby field got its confirmation and second oil well. Skelly Oil Co. 1 Bell, SW NE 23-24n-26w, Ellis County, flowed 556 bbl. of 42°-gravity oil daily on ½-in. choke from perforations at 8,083-94 ft. in Morrow sand. This field is the only oil producer in this gas county except for a new pool southeast of Harmon, Okla.

Gas news . . . Woodward pool, Woodward County, has three gas wells as a result of Union Oil Co. of California's successful completion at 1 Canfield, NE NE SW 6-22n-20w.

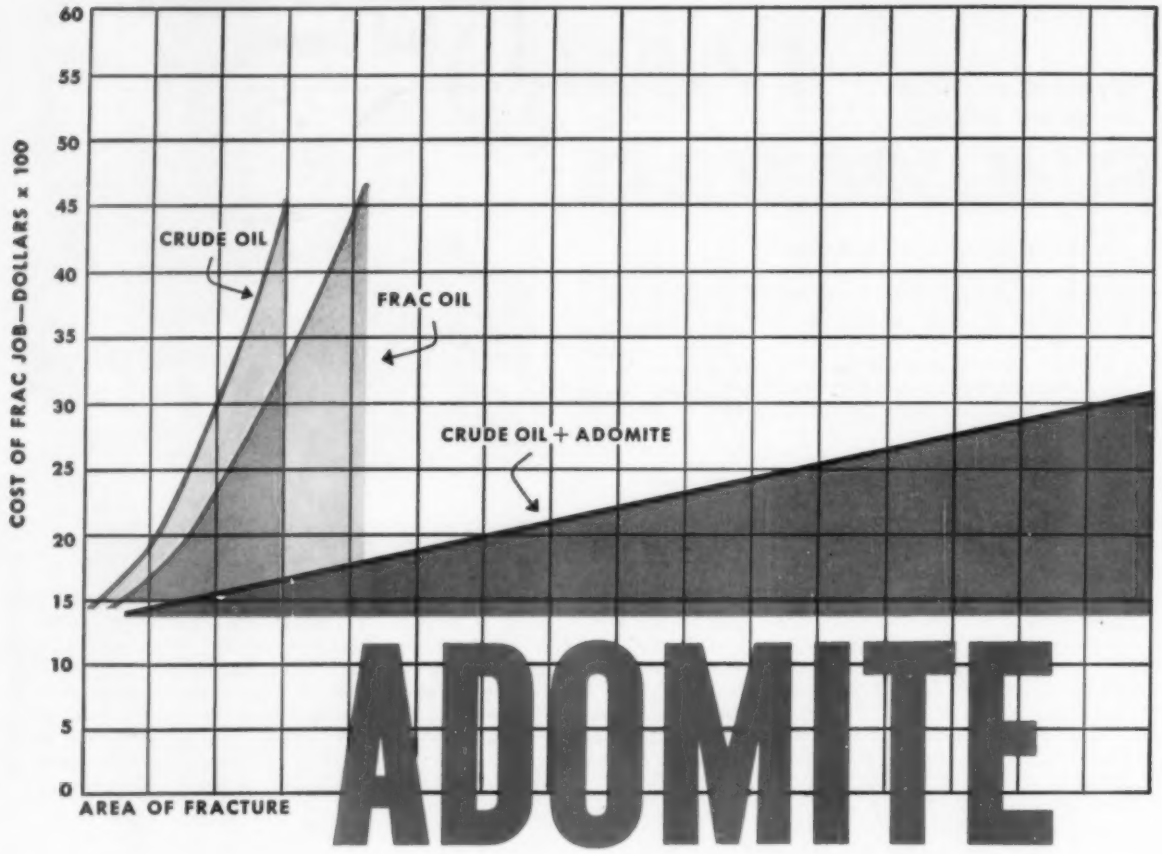
This Morrow Pennsylvanian well flowed 3,120 M.c.f.d. natural, from perforations at 8,185-8,200 ft. on ½-in. choke. There was a good show of condensate. Fracturing brought the gas flow up to 4,490 M.c.f.d.

Dual zone tested at new Montana find

Testing continues at a new discovery on Montana's Cedar Creek anticline. The Texas Co. 1 Guelff, SE NE 4-15n-54e, Dawson County, eastern Montana, flowed 394 bbl. of oil plus 1% water daily on 8/64-in. choke from perforations in the Silurian at 8,954-9,050 ft. and in Red River Ordovician at 9,486-9,562 ft. Earlier the well flowed 402 bbl. of oil and 4 bbl. water in 24 hours on ⅛-in. choke from the Silurian.

This dual zone discovery is 4½ miles northwest of Glendive field.

If you lose the fluid you're losing money!



stops fluid loss, gives more fracture at lower costs!

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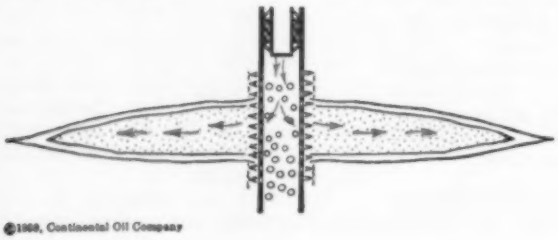

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Gas pay extended in Ohio's Muskingum

In Ohio, Ohio Fuel Gas Co. moved out more than 1 mile northwest of the new gas production in Newton Township, Muskingum County and completed 1 L. R. McCoy in Section 28.

The Clinton sand was topped at 3,522 ft. and was drilled in to 3,565 ft. where the gage was 26 M.c.f. natural with 310 M.c.f. after fracture and rock pressure of 1,052 psi.

An additional test of the area, 1 mile north of this completion is now being drilled by the same operator.

In New Mexico . . .

Confirmation well in, and two scheduled

Roosevelt County's Bluitt-Pennsylvanian pool received a confirmation well and locations for two additional tests.

Ohio Oil Co. 1 McGrail opened the pool earlier this year, flowing 719 bbl. of oil a day at 9,490-9,510 ft. Ohio 2 McGrail, 20-8s-37e, a north offset to the discovery, was completed for 299 bbl. of oil a day from the Permo-Pennsylvanian pay at 9,448-70 ft., through 16/64-in. choke. Flowing pressure was 375 psi. No. 2 McGrail was still making acid-water on its potential test. Before the potential test, the well flowed at the rate of 480 bbl. of oil a day through 16/64-in. choke.

Ohio has staked locations for two more tests in the area. No. 1 Federal-McGaw is a north offset to the well just completed, and 1-AV Federal-Silver is a southeast offset to the field discovery.

Shallow Delaware opener completed

One of southern Lea County's Delaware sand prospects has been completed as a flowing well.

Hill & Meeker 1-36 State, in 36-26s-32e, flowed 192 bbl. of 41° oil a day through 14/64-in. tubing choke. Flowing pressure was 600 psi. Perforations in the sand at 4,609-19 ft. were treated with mud acid and fractured with oil and sand. Gas-oil ratio was 414:1. Operators reported top of the Delaware lime at 4,543 ft., and the sand at 4,575 ft., on elevation of 3,110 ft.

The discovery is 5 miles east of North Mason (Delaware) pool, and about 2 miles northeast of the recently opened El Mar (Delaware) pool.

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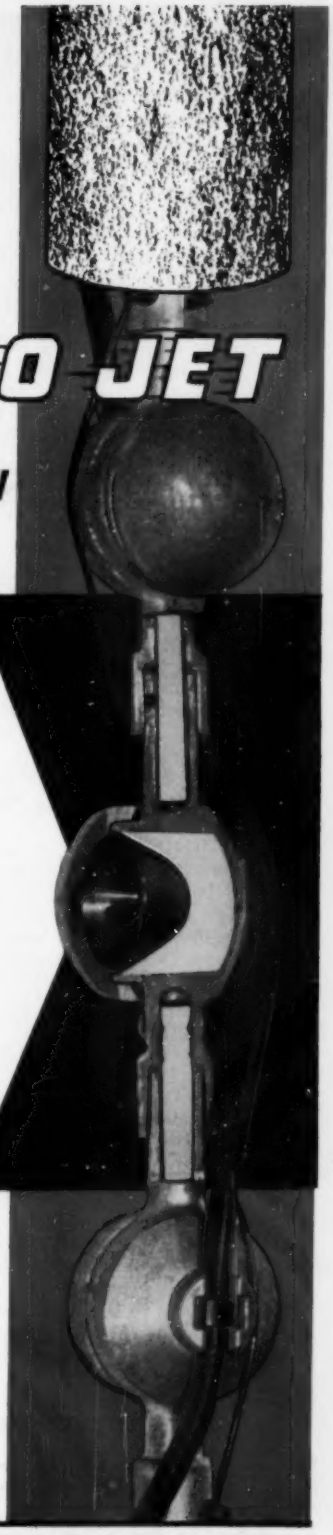
- Penetration— 7½ inches
- Well flow index 1.51 (151% of open core flow)
- Clean hole— no carrot plugging
- Excellent breakup of case and stem

1 11/16" O.D. 13.2 gram charge, spaced ½" from the target face

- Penetration— 6¾ inches
- Well flow index 1.37 (137% of open core flow)
- Clean hole— no carrot plugging
- Excellent breakup of case and stem

Explosive type spacer pictured at left allows charge spacing or skipped intervals as desired. Any length of blank spacers may be used with disintegrating explosive cord through the entire length to eliminate debris or bridging problems in such skips.



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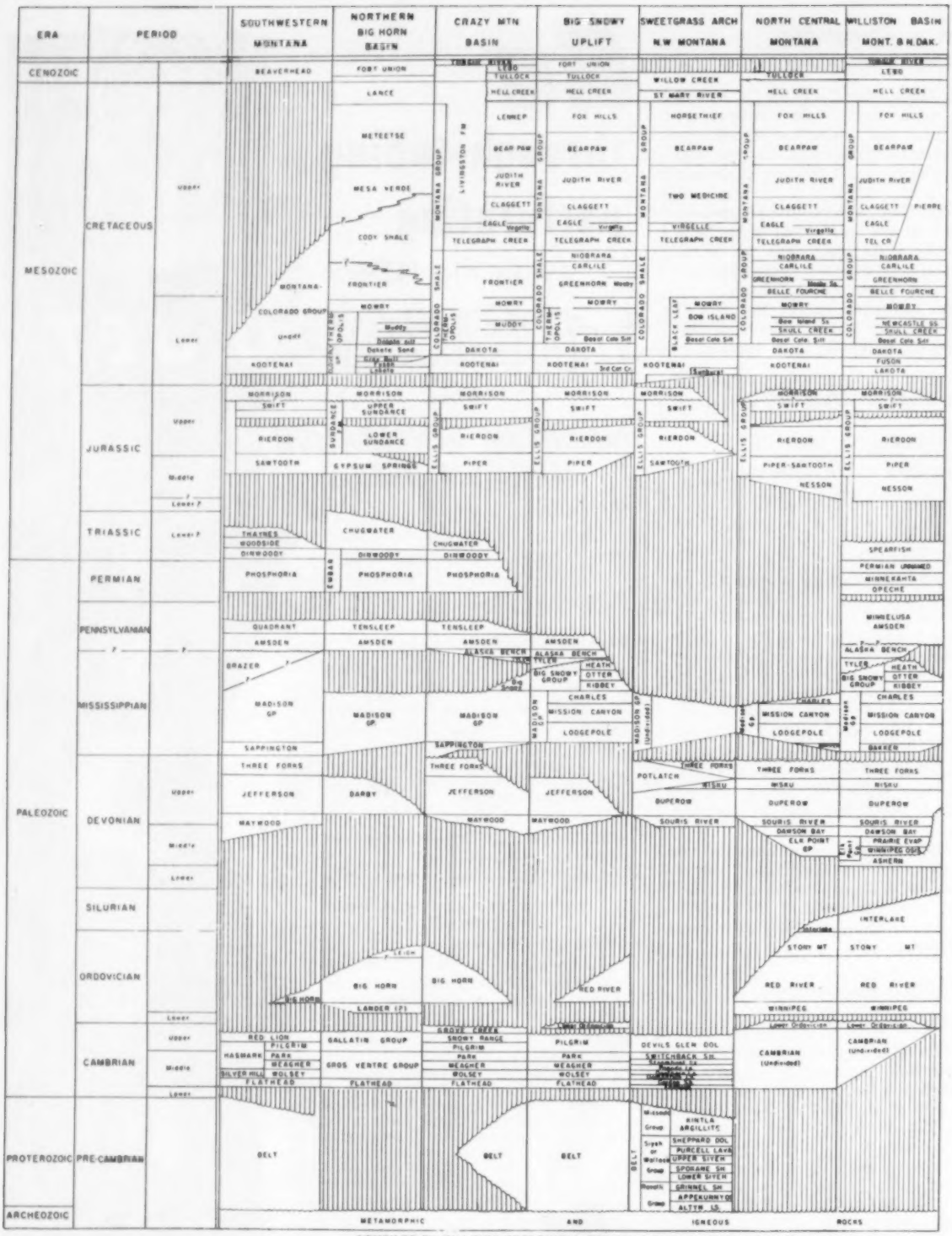
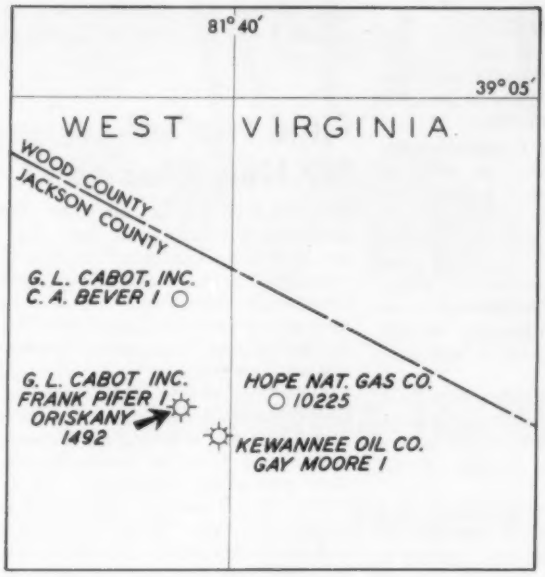


THIS Montana correlator was compiled by the Billings Geological Society Nomenclature Committee in 1958. It is included in the Guidebook of the Ninth Annual Field Conference 1958 recently released for sale by the society.

New books for oil finders

The Billings Geological Society has released the guidebook to the Ninth Annual Field Conference held in 1958 covering the Beartooth uplift and Sunlight basin regions. This meeting was held in conjunction with the Yellowstone-Bighorn Research Association.

The excellent accounting of the field conference contains many maps and cross-sections, photographs, and papers on various regional structures, problems, etc. One of the more outstanding inserts is a penetration chart.



A BRISK gas play moves along in West Virginia's Jackson County.

Pipeline to stir gas play

WEST VIRGINIA'S Oriskany play continues strong. Godfrey L. Cabot, Inc., of Charleston completed 1942 Frank Pifer for 1,750 M.c.f.d. after fracture. Total depth is 4,787 ft. Rock pressure was 1,690 psi. in 24 hours.

This well is located 2,700 ft. west of Longitude 81° 40′, 16,400 ft. south of Latitude 39° 05′, Belleville Quadrangle, Grant district, Jackson County. It lies 2,400 ft. northwest of Kewanee Oil Co.'s recently completed Gay Moore well which made 2,100 M.c.f.d. This is the sixth producer in the field. Potential open flow is 11,312 M.c.f.d. One well is still drilling, the Krennerman Oil & Gas Co. No. 1.

Godfrey L. Cabot, Inc. has staked another location about 7,200 ft. north of the 1492 Well, 1 Pifer. Hope Natural Gas Co. has staked No. 10225 H. M. Boso, unit lease of 155 acres, located about 2,300 ft. northeast of Hope's 10183 well, the 1 Bever.

Gas from this field has been contracted to Gas Transport, Inc., a Delaware corporation. It is located in Lancaster, Ohio, a subsidiary of Anchor Hocking Glass Corp. Pipelines are under construction.

Here is Indiana drilling news

Wildcatting continues brisk in Indiana's portion of the Illinois basin. Arthur J. Fritz 1 Fred Antell is a new discovery for Gibson County. The well, located in NE SW SE 3-2s-9w, recovered 860 ft. of clean oil and 40 ft. mud-mixed oil on a 2-hour drill-stem test of the O'Hara Mississippian at 1,639-51 ft. This new strike is 3 miles northwest of Oakland City, Ind.

Fritz' new strike is about 2 miles east of an active area in 5-2s-9w. Last summer Mutual Oil & Gas Co. and Fritz 1 William A. Schlamp, NE SW NE 5-2s-9w, pumped 300 bbl. of oil per day from the Benoist sand at 1,564-82 ft. after fracturing. This discovery set off a play that has netted 13 oil wells since then. Gages run up to 300 bbl. per day from three zones —the O'Hara, Benoist, and Aux Vases. Several operators are in the area. Mutual, Fritz, Kelley-Conrad-Kaye, Waite Petroleum, Inc., and F. L. Beard.

New Nevada test slated

A location was being selected by Ard Col Oil Co. for a 7,000-ft. test in Sections 11, 12, 13, or 14 of 21s-59e in Clark County. In general, this is about 10 miles southwest of Las Vegas. The operator hopes to get under way in about 60 days.

This is Clark County's second test on the books to be drilled soon. Colmarran Oil Products Co., Inc. has a location staked for a 6,000-ft. test in 26-22s-60e, 12 miles southwest of Las Vegas. This project is officially labeled idle at this time.

Fifth well added to Nebraska pool

Completion of the British American-Ambassador Oil Corp. 7 Johnson "O" in Banner County, Nebraska, as an oil producer is announced. The well swabbed 510 bbl. of oil in 24 hours and was put on the pump. Production is from a 15-ft. zone in the "J" sand, through perforations from 5,400-11 ft.

The well, which is the fifth successful producer in a development program in the Johnson "O" lease in Banner County, is located in 15-17n-53w, Willson Ranch field.

Permian producer extends Wyoming field

Wyoming's prolific Cottonwood Creek field in the Big Horn basin added another big extension well last week. Eliott Production Co. swabbed 840 bbl. of oil daily from the Phosphoria Permian at A-2 Federal in C NW NE 27-47n-91w, Washakie County. Perforations were at 9,884-9,924 ft. This extension discovery is 1 mile south of production in the field.

Sooner field gets Oil Creek well

One of southern Oklahoma's best Ordovician reservoirs, Southwest Enville field, got another good Oil Creek sand well.

George Cameron 1 Wilkins, C SW NE 7-7s-3e, Love County, flowed 2,800 M.c.f. of gas and 252 bbl. of distillate daily from perforations at 8,935 ft. Liner was on bottom at 9,025 ft. This southern Oklahoma field has 10 producers.

New book released

For the third straight year the oil and gas industry spent more than a billion dollars in 11 states making up the Rocky Mountain region. The year is summarized in Petroleum Information's annual Resume for 1958.

The billion dollar total was somewhat under the record year of 1956 and about even with the total dollar outlay in the region in 1957.

Petroleum Information's Annual Resume is the 28th published by the firm. The publication, which includes more than 100 pages of detailed statistical data on 1958 operations in the Rockies, as well as a 117-page narrative summary of regional activity, is available from Petroleum Information's offices and sales agents in Denver, Casper, Billings, Durango, and Bismarck.

These California spots make news:

San Emidio Nose

Kern County's elusive San Emidio Nose field, which had defied discovery by geologists for more than 20 years, turned up its second productive pay in less than 1 year.

The new pool discovery, Richfield Oil Corp. 83-9 KCL-H, is located just a few hundred feet northeast of the field discovery well in 9-11n-21w. Actually, the new well is a dual completion in both the Reef Ridge zone of the original discovery and in the new deeper pool Stevens zone.

Initial flow rates were 376 bbl. daily of 29.7°-gravity crude from the Reef Ridge at 11,590-11,637 ft. and 12,010-50 ft. through a 16/64-in. choke, and 429 bbl. daily of 30.2° gravity through an 8/64-in. choke from the new Miocene Stevens at 12,702-12,838 ft.

This structure was located on the San Emidio anticline as far back as 1934. But it wasn't until a number of deep tests by others had failed that Richfield was successful last year.

Richfield currently has five rigs working in the field while The Texas Co. recently announced a location about 1½ miles southwest of the main area of activity.

Buena Vista

The 555 pool of Buena Vista field in Kern County was extended ¼-mile northwest of the nearest previous producer by a General Petroleum Corp. test in SE NE 19-31s-23e. The GP completion, 3-19 Dabney, tapped the Upper Miocene Stevens zone at 5,405-5,619 ft. for 318 bbl. daily of 29.1°-gravity crude through a 13/64-in. choke. The pool discovery well completed by Tidewater Oil Co. in November 1957, in the interval 5,059-5,199 ft. is 1½ miles southwest of the General Petroleum well. This play is one of the state's most active with eight rigs operating.

Beehive Bend

Northern California's gas fields are beginning to see an increase in drilling with the advent of spring. Some of the operators haven't waited, particularly in the Beehive Bend gas field of Glenn County. This field was the scene of two significant tests recently.

... **W. S. Payne, Jr.** and associates gave the field a new pool discovery with a test in the southwest flank of the field. The well, 1 D'Egelbert, was being completed in selectively perforated intervals between 4,582 and 4,690 ft. On a drill-stem test at 5,692-5,703 ft. the well flowed at a 1,400 M.c.f.d. earlier in its drilling.

... **McCulloch Oil Exploration Co. of California** completed an excellent well about 1 mile east of Payne's new pool discovery. The McCulloch well was completed in selectively perforated intervals between 6,185 and 6,267 ft. Initial production varied between 2,180 M.c.f.d. through a ¾-in. choke and 9,900 M.c.f.d. through a 42/64-in. choke with a light mist of water.

Elsewhere in the Beehive Bend field, General Petroleum Corp. was cementing 5½-in. casing at 6,590 ft. with a test virtually in the middle of the field.

In the same section as Payne's new pool, but about 2,000 ft. northeast of it, Berry Holding Co. was drilling in sand and shale at 2,850 ft. in the field's only other active project.

McKittrick

One of the state's oldest areas of production, the McKittrick field in Kern County was being credited with a new discovery by Standard Oil Co. of California. The Standard wildcat is located about 1½ miles northeast of the nearest production in the McKittrick field. Details on the wildcat were scarce, but it reportedly blew clean gas at an undisclosed rate from an interval at 977-1,017 ft. The well has been shut in by the operator.

This general area dates its oil activity back to the early 1870's when asphalt beds were opened there with production freighted by team to Bakersfield 30 miles to the east. The first drilled discovery is noted in 1887 when a pool was found at 1,048 ft. Construction of a railroad in 1883 to the field spurred drilling. By 1915, about 500 wells had been drilled of which almost 300 are still on production. Cumulative production to date from this old field is in excess of 104,000,000 bbl.

East Gosford

Signal Oil & Gas Co. completed an extension on the north edge of the East Gosford field in Kern County for a shallow pool discovery. The Signal new pay was located at 6,965-7,056 ft. Initial production was 255 bbl. daily of 33°-gravity crude through a 14/64-in. choke. The shallow pool is in the Stevens as are the three other producing intervals found in East and West Gosford. The shallowest Upper Stevens production found at East Gosford before this discovery was at around 7,050 ft. in the main part of the field.

Field trip set for New Mexico

GEOLOGISTS from all over the southwest will join with those from the Panhandle Geological Society of Amarillo this May for the 1959 Field Conference. This year's trip will be through the southern Sangre de Cristo Mountains and basin areas of northeastern New Mexico.

Objectives of this conference are: (1) To examine and compare the lithofacies of the outcropping Pennsylvanian and Permian sediments with their subsurface equivalents, (2) To review the oil and gas exploration in northeastern New Mexico and discuss recent developments, and (3) To discuss the development of the sedimentary basins and their geographic limits.

Registration for the trip begins on the afternoon of May 20 at the La Fonda Hotel in Santa Fe. The trip is under the leadership of C. B. Read and E. H. Baltz, USGS. The caravan will leave Santa Fe on the morning of May 21. Overnight stops will be made at Las Vegas and Taos. Termination point is Cimarron on May 23.

Banquets will be held at both overnight stops.

Those interested should contact the Panhandle Geological Society at Amarillo, Box 2473.

Mississippi's Sweetwater stretches north

Productive limits of Sweetwater field, in Lincoln County, South Mississippi, are being extended ¾ mile north. Extension well, drilled by Riverside Oil Co., pumped and flowed 89 bbl. net oil per day on completion gage. However, it is making considerable water, estimated at more than 350 bbl. per day. Gravity of the oil is 38.5°.

Production is from Sweetwater field's Lower Tuscaloosa pay, perforated at 10,848-57 ft. Hole was drilled to 10,952 ft. Location is on Riverside's Kyzar lease in 15-5n-8e.

North Texas has Oil Creek hit

Discovery allowable is being requested by Shell Oil Co. for its 1 R. L. Sweeney, 6 miles southwest of Pottsboro in Grayson County, Texas.

On final tests the well flowed 191 bbl. of 35° oil a day on 18/64-in. choke, from perforations in the "V"

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sand at 8,216-34, 8,250-62 and 8,274-88 ft., in a section of the Oil Creek, of Ordovician age. Flowing tubing pressure was 580 psi.; gas-oil ratio was 1,770:1. Total depth was 8,647 ft. Top of pay was picked at 8,214 ft. on derrick-floor elevation of 684 ft.

Operator has suggested "Hagerman 'V' Sand" as the new-field designation. The well is about ¼ mile east of comparable production, but separated by fault structure. Location is in the J. Doniphan Survey, A-385.

Mississippi gets fifth big strike

Monsanto Chemical Co., through its Lion Oil Co. division, has completed a new deep multiple-pay oil-discovery well in Simpson County, South Mississippi.

Its 1 Magee, ¾ mile southwest of Merit, in 17-1n-4e, flowed 552 bbl. of 37.5°-gravity oil per day through 10/64-in. chokes in a dual completion from two Lower Cretaceous-Paluxy sands, one at 12,121-44 ft. and the other at 12,174-87 ft. Commercial production also has been assured in the deeper Mooringsport zone, at 12,458-82 ft., which earlier tested a flow of 216 bbl. of oil per day through ¼-in. choke. Location has been made for a north offset. This is the fifth new field found in South Mississippi this year.

New Montana field extended

EXPLORATORY news in Montana centers around recently opened Stensvad field in Rosebud County. This Tyler sand field added a good producer at McAlester Fuel Co. 2-A Montana Federal in NW SW SW 12-11n-31e. It flowed 443 bbl. of oil per day. This one is offset by another indicated producer where 20 ft. of good sand was cored. Testing is due at this new prospect. One more well in the field is an indicated extension strike.

Offshore well hits gas pay

NEW OFFSHORE gas-condensate production is being opened by a discovery by CATC Group in Block 69, West Delta area, Gulf of Mexico. Discovery well, completed in three zones, is 25 miles off the coast of Plaquemines Parish, Louisiana. It is 2 miles northwest of CATC Group's triple-zone discovery well of West Delta Block 70 field, opened early in 1958.

Deepest pay, perforated at 7,516-21 ft. tested 3,170 M.c.f. of gas and 48 bbl. of 51°-gravity condensate per day through 14/64-in. choke. Flow from the middle zone at 6,280-85 ft. was 3,530 M.c.f. of gas and 36 bbl. of 48.4°-gravity condensate per day through 16/64-in. choke. The upper zone, at 6,168-73 ft., was good for 3,662 M.c.f. of gas and 24 bbl. of 50.4°-gravity condensate per day.

The pays are in hole drilled to 13,004 ft. The well is 1 DCS-0181 (State Lease 1533).

Discovery wells

CALIFORNIA

Kern County: Richfield Oil Corp. 83-9 KCL H, SE NE 9-11n-21w, 805 BOPD, dual completion, upper-interval perfs. 11,590-11,637 ft. and lower perfs. 12,702-12,838 ft., upper-zone production 376 bbl. daily, 29.6° gravity, 17/64-in. choke, lower-zone production 429 bbl. daily, 30.2° gravity, 8/64-in. choke, TD 12,838 ft. (Deeper Stevens sand pool discovery two locations east of San Emidio Nose discovery.)

Atlantic Oil Co. 8 MJMM & M-Jeppi, NE NW 17-30s-29e, 100 BOPD, 45°-gravity crude, 0.1% cut, 1,500 M.c.f.d.,

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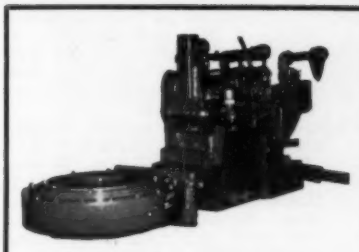
58	1½" to 5½"	300 to 4,000 ft. lbs.



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16/64-in. choke, perfs. 5,936-6,020 ft., 6,025-39 ft., 6,042-44 ft., 6,046-60 ft., 6,063-98 ft. and 6,102-08 ft., TD 6,200 ft. (New fault block discovery in Edison field.)

Standard Oil Co. of California, 9-5 Spreckles, SE NE 16-30s-22e, perfs. 977-1,017 ft., blew gas at undisclosed rate, shut in, TD 1,550 ft. (New pool discovery 1½ miles northeast of McKittrick field.)

WESTERN CANADA

Alberta: Hudson's Bay-Pan American 11-10-25-19 Wintering Hills, LSD 11, 10-25-19w4. Basal Quartz oil discovery, TD 4,770 ft.

Cities Service Oil Co. 14-13-48-6 Carnwood, LSD 14, 13-48-6w5. Cardium oil discovery. TD 4,665 ft.

British Columbia: FPC-Richfield C56-D Daiber, 56-D-94-B-16. Triassic gas discovery. TD 4,894 ft.

Sinclair-Pacific D37E Doig River, 39-E-94-A-16. Triassic oil discovery. TD 3,910 ft.

Saskatchewan: Canpet et al 4-11 Eagle Lake, LSD 4, 11-31-21w3. Viking oil discovery. TD 2-209 ft.

Amerada-Tidewater 2-32 Crown S-AM, LSD 2, 32-6-1w2. Mission Canyon oil discovery. TD 3,975 ft.

Paradise 13-21-9-25 Routledge, LSD 13, 21-9-25w1. Mississippian oil discovery. TD 2,105 ft.

CEGO-High-Crest 5-8 Oxbow, LSD 5, 8-3-2w2. Mississippian oil discovery. TD 4,712 ft.

LOUISIANA OFFSHORE

West Delta area: CATC Group (Continental Oil Co.) 1 OCS-0181 (State Lease 1533), Block 69, Gulf of Mexico. IP 48 BCPD, 3,170 M.c.f.d., 14/64-in., 51°, TP 2,800 psi., perf. 7,516-21 ft., 36 BCPD, 3,530 M.c.f.d., 16/64-in., 48.4°, TP 2,300 psi., perf. 6,280-85 ft., and 24 BCPD, 3,662 M.c.f.d., 14/64-in., 50.4° TP 2,400 psi., perf. 6,168-73 ft. TD 13,004 ft. New-field discovery.

NORTH LOUISIANA

Ouachita Parish: Arkansas Louisiana Gas Co. 1 Clara Hodge, 27-18n-1e. IP 4,200 M.c.f.d., 113 BC per M.M.c.f., 20/64-in. TP 3,000 psi., perf. 9,803-12½ ft., Cotton Valley-Davis sand. TD 9,850 ft. Elev. 186 ft., Cotton Valley Black Shale 8,990 ft., Bodcaw 9,518 ft. New pay in Calhoun field.

Webster Parish: Pan American Petroleum Corp. 1 Walker, 19-19n-8w. IP 73 BCPD and 3,146 M.c.f.d., 14/64-in., 65.7°, TP 2,542 ft., perf. 6,841-54 ft., James lime, and 56 BOPD, 24/64-in., 13.4°, TP 497 psi., GOR 50 cu. ft. per barrel, perf. 6,462-88 ft., Rodessa sand. TD 7,696 ft. New pay in Minden field.

SOUTH LOUISIANA

Terrebonne Parish: Anderson-Prichard Oil Corp. 1 South Coast, 20-17s-18e. Shut-in gas well, flowed 1,000 M.c.f.d., spray condensate, 10/64-in., TP 3,850 psi., preliminary test, perf. 11,623-38 ft. TD 12,240 ft. New gas reservoir 1 mile southeast of South Houma discovery well.

Vermilion Parish: Gulf Oil Corp. 1 State Lease 3306, Township 16s-4e, Vermilion Bay IP 328 BOPD, 4 M.M.c.f.d., 15/64-in., 48.9°, TD 3,310 ft., perf. 15,172-89 ft., and 336 BOPD 3 M.M.c.f.d., 14/64-in., 55.8°, TP 3,400 psi., perf. 14,640-54 ft. TD 15,430 ft. New-field discovery.

MISSISSIPPI

Lincoln County: Riverside Oil Co. 1 Kyzar, NE SE 15-5n-8e. IPP 89 BOPD (net), 356 BW, 38.5°, perf. 10,852-57 ft. Tuscaloosa. TD 10,952 ft. Elev. 487 ft., Lower Tuscaloosa 10,690 ft. Extends Sweetwater field ¾ mile north.

Simpson County: Jett Drilling Co., Inc., 1 Addie Magee, NW SW 17-1n-4e. IP 533 BOPD, 10/64-in., 38.4°, TP 875 psi., perf. 12,121-41 ft. and 12,174-87 ft., Paluxy. TD 14,521 ft. Elev. 291 ft., Lower Cretaceous 9,303 ft., Mooringsport 12,240 ft., Hosston 14,075 ft. Discovery well Merit field. This well also perforated in Mooringsport at 12,512-14 ft. and will be dually completed.

NORTH DAKOTA

Burke County: Vern O. Lund 1 N. Gullickson, C SW SW 8-161n-91w. IPF 215 BOPD, Nesson discovery, new field. TD 6,754 ft.

OKLAHOMA

McClain County: Fain Porter Drilling Corp. 1 Mathis, C SE SE 34-6n-3w. IPF 189 BOPD, 40°, Hunton 8,223-42 ft., 18/64-in choke. TD 9,375 ft. Oil discovery, new field.

Woodward County: Sinclair Oil & Gas Co. 1 Dotter Unit, C SE NW 31-26n-19w. IP 6,640 M.c.f.d., Morrow Pennsylvanian 6,388-6,409 ft. TD 6,660 ft. Gas discovery, new field. Named Southeast Lovedale field.

TEXAS GULF COAST

Aransas County: Sunray Mid-Continent Oil Co. 1 State Tract 96, Aransas Bay, 6½ miles north of Rockport. IP 33 BOPD, ⅛-in., 42°, TP 1,060 psi., GOR 3,480 cu. ft. per bbl., perf. 8,805-15 ft., Frio. TD 11,864 ft. Discovery well Long Reef field—3,400 ft. East Goose Island gas well.

Bee County: Harkins & Co. et al. 2 Carpenter, R. P. Little Sur., A-464, 7 miles northwest of Beeville. AOF 8 M.M.c.f.d., shut-in. pressure 3,723-31 ft., perf. 3,723-31 ft. Hockley. TD 3,792 ft. New-field discovery.

Harkins & Co. 2-B Gillette, R. P. Little Sur., A-463, 7 miles northwest of Beeville. IP 45.53 BOPD, 7/64-in., 33.5°, TP 260 psi., GOR 329 cu. ft. per bbl., perf. 3,740-46 ft., Hockley. TD 3,825 ft. Second well and new pay in newly opened field.

Tennessee Gas Transmission Co. 1-B Dahl, T. W. Whittington Sur., A-327, 4 miles northwest of Pettus. AOF 6,250 M.c.f.d., GLR 110 M.c.f. per bbl., 43.5°, Shut-in Tp 1,659 psi., perf. 6,687-89 ft., Wilcox-Slick sand. TD 7,301 ft. New-field discovery in Burnell-South Caesar-Dahl area.

Jasper County: Timberland Exploration Co. 1 T. O. Sutton, M. Racki Sur., A-1036, 1½ miles northeast of Rockland. IPP 13.97 BOPD, 22°, perf. 1,263-71 ft., basal Jackson. TD 1,324 ft. Reopens depleted Rockland field.

Kleberg County: John B. Hawley, Jr., 1 Dennett et al., Section 37, Farm Tract 15, Kleberg Town & Improvement Co. Subd., 8 miles southeast of Kingsville. AOF 3,700 M.c.f.d., GLR 38.8 M.c.f. per bbl., 54.2°, shut-in. TP 2,456 psi., perf. 6,341-48 ft., Frio. TD 6,481 ft. New pay in Ricardo field.

Refugio County: W. Earl Rowe 1 Birdie Driscoll Rooke Estate, Block 5, La Rosa Ranch Subd. "B," Jose Miguel and Maria Aldrete Grant, 4 miles south of Woodsboro, perf. 6,420-26 ft., Frio. TD 7,989 ft. New-field discovery.

San Patricio County: Houston Natural Gas

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Producing Co. 2 Pulliam, Section 78, G. H. Paul Subd., Coleman-Fulton Pasture Co.'s Lands, Richard Eggleston Sur. 11 and 12. IP 64.29 BOPD, 45.1°, GOR 11,900 cu. ft. per bbl., perf. 9,627-35 ft., Frio-Watson sand. TD 9,915 ft. New pay in Commonwealth field.

WEST TEXAS

Andrews County: Fred Turner, Jr. 5 J. E. Parker, 19-A44-PSL Sur., new pay in Parker field. IP 438 BOPD, ½-in. choke, 36°, GOR 800:1, TP 350 psi., Wolfcamp 8,895-8,905 ft. TD 9,100 ft., elevation 3,176 ft.

Pan American Petroleum Corp. 1 University "DJ," 3-9-University Lands Sur., 8 miles southwest Andrews. IP 183 BOPD, 12/64-in. choke, 39°, GOR 592:1, TP 75 psi., Pennsylvanian 9,132-47 ft. TD 10,738 ft., elevation 3,209 ft.

Magnolia Petroleum Co. 4 Special-Cowden "B," 12-A55-PSL Sur., Ellenburger discovery in East Dollarhide field. IP 401.6 BOPD, 24/64-in. choke, 45°, GOR 830:1, TP 170 psi., top pay 12,470 ft., perf. 12,583-12,760 ft.; Regular pay potentials: 257 BOPD, 32/64-in. choke, 41°, GOR 535:1, TP 100 psi., Silurian 11,067-90 ft.; 215 BOPD, 28/64-in. choke, 39°, GOR 1,118:1, TP 125 psi., Devonian 10,194-10,210 ft. TD 12,832 ft., ground elevation 3,139 ft.

Borden County: Hill & Meeker, et al. 1 Morris Miller "366," Sec. 366, Blk. 97, H&TC Sur., 12 miles east of Gail. IPP 149 BOPD, 41°, GOR 80:1, Ellenburger 8,083-86 ft. TD 8,418 ft., elevation 2,567 ft.

Crane County: R. F. Windfor 6 M. B. McKnight "T," 10-B21-PSL Sur., new pay in Sand Hills McKnight field. IP 35 BOPD, ¼-in. choke, 34°, GOR 10,766:1, TP 220 psi., Clear Fork 3,656-3,766 ft. TD 4,840 ft., elevation 2,680 ft.

Crosby County: Smith & Breyer et al. 1 Helen L. Mountjoy, 1039-1-H&OB Sur., 4 miles southeast of Robinson. IPP 121 BOPD, 27°, GOR 300:1, Clear Fork 4,278-86 ft. TD 4,319 ft., ground elevation 3,058 ft.

Dawson County: Forest Oil Co., Pan American Petroleum Corp. 1 E. W. Harris, League 267, Moore CSL Sur., 13 miles southwest of Lamesa. IP 406 BOPD, $\frac{3}{16}$-in. choke, 39°, GOR 21:1, Fusselman 12,064-88 ft. TD 12,754 ft., ground elevation 2,946 ft.

Ector County: Magnolia Petroleum Co. 3 Sallie W. Ratliff, 36-42-T1S-T&P Sur., 5 miles north of Odessa, Bend limestone pay discovery in Ratliff-Ellenburger field. IP 290 BOPD, 12/64-in. choke, 42°, GOR 1,558:1, TP 1,650 psi., pay 10,794-95 ft. TD 10,795 ft., elevation 2,999 ft.

Gaines County: Tennessee Gas Transmission Co. 1 Kay Kimbell, 104-H-D&W Sur., 14 miles east of Seminole. IP 289 BOPD, 14/64-in. choke, 27.7°, GOR 278:1, TP 350 psi., top Pennsylvanian pay 10,349 ft., perf. 10,386-97, 10,402-08 ft., TD 11,537 ft., elevation 3,203 ft.

Garza County: Southern Union Gas Co. 1-A Koonsman, 4-2-T&NO Sur., 13 miles southwest of Justiceburg, 1 mile southeast of Red Loflin field. IP 210 BOPD, 16/64-in. choke, 39°, GOR 269:1, TP 300 psi., Strawn 7,694-99, 7,666-80 ft. TD 8,360 ft., ground elevation 2,388 ft.

Martin County: Cities Service Production Co. 1 Glass, 29-38-T1N-T&P Sur., 10 miles northeast of Midland. IP 229 BOPD, 29/64-in. choke, 44°, GOR 1,200:1, TP 200 psi., Strawn 10,512-10,619 ft. TD 11,944 ft., PB 10,669 ft., elevation 2,797 ft.

Husky Oil Co. 1 Knox, League 253, Ward CSL Sur., 27 miles northwest of Stanton, 4½ miles southeast of Breedlove field. IP 116 BOPD, ½-in. choke, 39°, GOR 482:1, TP 100 psi., Wolfcamp 9,128-46 ft. TD 11,950 ft., elevation 2,888 ft.

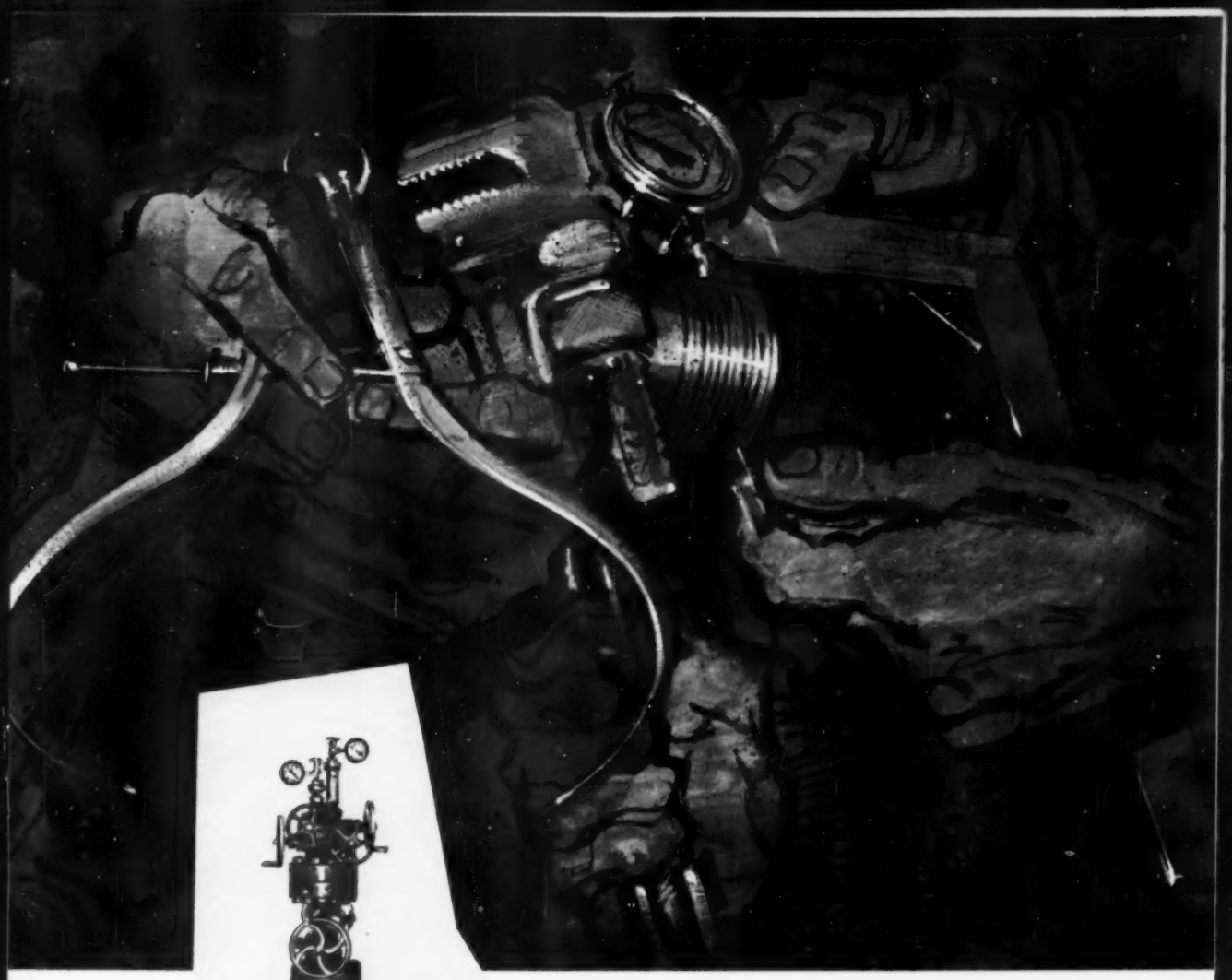
Runnels County: Karl Hoblitzelle 1 R. H. Herring, Jr., 32-1-H&GN Sur., 9 miles northwest of Ballinger. Workover well, originally drilled dry in 1952. IP 1,350 M.c.f. of gas, Odom limestone 4,694-4,700 ft. TD 4,852 ft., ground elevation 1,804 ft.

Schleicher County: Sinclair Oil & Gas Co. 2 Catherine Martine, 31-8-TW&NG Sur., 10 miles northwest of Ft. McKavett. IP 32,500 M.c.f. of gas, calculated open-flow, Strawn limestone, 4,530-35 ft.; IP 1,925 M.c.f. of gas, Strawn sand 4,376-82, 4,388-92 ft. TD 5,300 ft.

Luling Oil & Gas Co. 1 J. F. Webster, 5-8-TW&NG Sur., 23 miles northeast of Eldorado. Workover, originally drilled dry in 1950. TD 5,206 ft., IPP 107 BOPD, 37°, GOR 439:1, Pennsylvanian perfs. 4,271-75 ft.

Sterling County: J. D. Hancock 1 Clark, 33-11-SPRR Sur., 9 miles southeast of Sterling City, new pay discovery in Clark-San Andres field. IPP 25 BOPD, 34°, GOR 85:1, San Angelo 1,305-09 ft. TD 1,309 ft., ground elevation 2,293 ft.

Winkler County: Cities Service Oil Co. 1 Buttram, 17-C23-PSL Sur., 15 miles northwest of Kermit, ½ mile west of Bone Spring production. IPP 93 BOPD, 26°, GOR 106:1, Yates 3,153-3,237 ft. TD 9,980 ft., PB 3,250 ft., ground elevation 2,881 ft., top Brushy Canyon 6,698 ft., Bone Spring 8,191 ft.



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Research Is to Make Money

. . . and the best way to do it is to give your scientists enough freedom to be creative, says Sun's Charles Thomas.

A RESEARCH director, to be successful, should not take his title too literally.

If he attempts to direct too closely the efforts of his scientists, he stands to lose the creativity which invents and discovers and which gives his company the biggest payoffs.

That's the opinion of Dr. Charles L. Thomas, director of manufacturing research and development of Sun Oil Co., and this versatile and dynamic scientist lives the philosophy he preaches.

The head man of 375 key scientists and technicians of Sun laboratories may deviate some in his administrative capacities from the long-haired, straight-laced type of protocol. Yet, his system is good. It clicks.

He has been as deep in molecules as anyone in his field. However, in a firm and friendly way, he leads a talented staff through suggestion and proposal rather than with directives and edicts and unresearchmanlike commands.

Revenue research . . . The object of his research group, he says, is to create opportunities for the company to make money.

Too much direction can stifle creativity, which he views as spawned and bred through insatiable curiosity.

Dr. Thomas is sure "creativity can be inspired." That, he feels, is his big challenge.

He says "the thing a research director should do least is direct research."

Fancy laboratories and expensive equipment help a researcher but they are only aids to proving or disproving an idea. The idea itself is born in an individual's mind.

Dr. Thomas was born in Hendersonville, N. C., in 1905. He became interested in chemistry in reading of drug and dye shortages during World War I.

Science looks ahead . . . He armed himself with a Ph.D. in organic chemistry from Northwestern University, following undergraduate work at the University of North Carolina. He joined Universal Oil Products Co. in 1931, working on cat cracking, cat reforming, and catalyst development for 14 years.

He went to Great Lakes Carbon Corp. in 1945 as R & D director and moved to Sun in 1951. After 8 months as staff assistant to Dr. J. Bennett Hill, then research director, he was named manager of the chemical research labs at Norwood, Pa.

In early 1953, he became associate director of R & D and took over as director in 1956 when Hill retired.

A certain amount of crystal-ball gazing is necessary to anticipate the future, he says. His group regularly forecasts product quality improvements needed by customers 10 years ahead.

Many hobbies . . . Astute Dr. Thomas is concerned with the pace research itself has been maintaining—a pace which has been pulling many true researchers into administrative jobs. This matter of picking good technical administrators is a ticklish one, as he sees it.

He realizes the more a man progresses administratively, the less he uses his creative abilities. Both are important. The scientist's enthusiasm never must be dulled.

Dr. Thomas is married to the former Virginia Miner of Sheridan, N. Y. They have a 22-year-old son, Karl M., now at Cornell University studying mechanical engineering.

There are 125 patents issued to the Sun research leader either as inventor or co-inventor. He is an amateur photographer and a golfer. He is a pilot, flew for 16 years, voluntarily clipped his own wings for lack of time. His home is alive with hi-fi he rigged up.

His interest in music is not only as a listener.

He played the bassoon in the University of North Carolina symphony, and he helped pay for his college education by playing saxophone in a campus dance band.

●

Charles E. Porterfield, engineer trainee in Houston with Monsanto Chemical Co.'s Lion Oil division, has been promoted to petroleum engineer, production. He will headquarter in Denver.

Winfield S. Schmidt, manager of the operations section of Atlantic Pipe Line Co.'s crude-oil division, has been named assistant manager of the crude-oil pipeline division. Schmidt will become division manager when **J. Harry Wood, Jr.,** retires in July. Schmidt has been with Atlantic since 1917. He was assistant manager of the products-pipeline division at one time.

Three new directors have been elected to the board of Pennsylvania Grade Crude Oil Association. They are **Walter Small,** retired geologist and president of Middle District Producers Association; **James D. Berry, Jr.,** independent producer and a director of Quaker State Oil Refining Corp.; and **Edward Martin,** president of Southwest Pennsylvania Producers Association. Martin is a former governor of Pennsylvania and former U.S. senator. **William A. Harper,** assistant secretary of Quaker State, has been elected assistant treasurer of the Penn Grade association.

EVANS BEDFORD ELIAS GALLOWAY

New Assignments Go to Pan Am Executives

John R. Evans, vice president and division manager for Pan American Petroleum Corp. in Fort Worth, has been named general manager of production for Standard Oil Co. (Ind.), the parent company.

Evans will coordinate production and crude-oil supply activity of Indiana Standard with operations of principal subsidiaries including Pan Am, Service Pipe Line, Indiana Oil Purchasing, and Tuloma Gas Products.

Evans' transfer has set off several changes within Pan American. Charles F. Bedford, vice president, production, and a director of the company, will move to Fort Worth as vice president and North Texas-New Mexico division manager, succeeding Evans. Whitney M. Elias, Pan American vice president, director, and Texas-Louisiana Gulf Coast division manager in Houston since 1956, has been named vice president, production. He will move to Tulsa to replace Bedford. George H. Galloway, vice president, director, and manager of the Canadian division since 1952, has been transferred to Tulsa as vice president, exploration, and a director. This post has been vacant for several months. The appointments are effective May 1.

Richard E. Graumann has joined the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.), as chemical engineer.

Robert M. Henderson, formerly with American Cyanamid Co., has joined Petroleum Chemicals, Inc., New Orleans, as director of the market-research division.

Phillip G. Cook has been transferred by Union Oil Co. from Orcutt, Calif., to Santa Paula, Calif., and promoted to division geologic engineer there.

Francisco Chairez has resigned as chief chemist of Eastern States Petroleum & Chemical Corp. to join National Aluminate Corp., Chicago. He will move to Mexico City as representative and manager of National Aluminate's operations in Mexico. Chairez is a graduate of Rice Institute and did advanced study at the University of Houston.

G. V. Land, president and chief executive officer of American Climax Petroleum Corp. and vice president of American Metal Climax, Inc., has resigned to become a general partner in Lambert & Co. and Lambert Oil Exploration Co. Land will continue as a director of American Climax Petroleum. He was head of the oil and gas division of Climax Molybdenum Co. before becoming president of American Climax Petroleum, an outgrowth of Climax Molybdenum's merger with American Metal Co., Ltd., in 1957.

H. W. Jouette, mechanical superintendent at Magnolia Petroleum Co.'s Beaumont, Tex., refinery, has been named general superintendent, mechanical. **Eber Peters,** technical director at the refinery, has been promoted to manager of petrochemical projects, a new position. **Hugh E. Kelley,** head of the economics department at Beaumont, has been named head of the new planning department. Jouette's appointment has lead to two other changes. **J. P. Thompson,** assistant mechanical superintendent, moves up to superintendent, succeeding Jouette. **M. G. Livingston,** staff engineer in the engineering department, will replace Thompson. In the new petrochemical projects section, **George C. Debney,** chief engineer, has been named assistant general manager of petrochemical projects. New petrochemical positions are the result of plans to build the world's largest ethylene unit at the Beaumont refinery (OGJ, Mar. 9, p. 93). **R. P. Thompson,** assistant technical director, has succeeded Peters as technical director at the refinery. **M. B. Tohline,** assistant chief engineer, will succeed Debney as chief engineer.

W. D. Paterson, formerly with Sun Oil Co. in Billings, Mont., has joined the geological staff of Monsanto Chemical Co.'s Lion Oil division in Liberal, Kans.

Lewis H. Bond has been elected president and a director of the Fort Worth National Bank. Bond was head of the proration section of Pan American Petroleum Corp. (then Stanolind Oil & Gas Co.) before joining the bank in 1952 as petroleum engineer. He became vice president and petroleum engineer in 1954.

R. C. Woerner, director of engineering at Petro-Tex Chemical Corp.'s Houston plant, has been promoted to plant manager. **J. B. Williams** will succeed Woerner as director of engineering. **D. V. Fitz** is general superintendent at the plant. In other changes, **H. A. Harrison** has been named assistant general superintendent, **C. H. Sloan** is production superintendent, and **T. A. Rodgerson** is process superintendent. Petro-Tex is a subsidiary of Tennessee Gas Transmission Co. and Food Machinery & Chemical Corp.

John Pearce, Superior Iron Works & Supply Co., Tulsa, has been named 1959 chairman of the national board of regents of Nomads. **Thomas M. Lumly, Jr.,** the Refinery Engineering Co., Tulsa, has been elected secretary-

PEARCE LUMLY

treasurer. Pearce succeeds **Herb E. Maland,** R. J. Eiche & Associates, Inc., New York, as Nomads board chairman. **Maurice F. Delano, Jr.,** R. S. Stokvis & Sons, Inc., New York, was secretary-treasurer last year. Both Pearce and Lumly are regents in the Tulsa chapter of Nomads. Pearce was 1958 president of the Tulsa group.

Mack G. Trusdel, New Orleans division petroleum engineer for The Texas Co., has been promoted to superintendent of the Harvey, La., district. He will be succeeded in New Orleans by **A. M. Shook,** Houston division petroleum engineer. **R. C. Shields,** petroleum engineer on the staff of the general manager, domestic producing department, in Houston, will move up to Houston division petroleum engineer, succeeding Shook.

John Armstrong, Cities Service Oil Co's southwestern division geophysicist in Midland, Tex., has been appointed acting chief geophysicist for the company. He will headquarter in Bartlesville, Okla. Armstrong replaces **R. M. Bradley,** who has been transferred to Africa-Cities Service Petroleum Corp. in Algeria on temporary assignment. Gene Current, assistant division geophysicist in Lafayette, La., will succeed Armstrong in Midland.

ARMSTRONG

William W. Thames, geologist, senior grade, for Pan American Petroleum Corp. in New Orleans, has been promoted to district geologist in Corpus Christi, Tex.

James W. Clark has joined the production and exploration department of Monsanto Chemical Co.'s Lion Oil division in Midland, Tex.

Everett W. Hubbard, Jr., senior mechanical engineer at Kerr-McGee Oil Industries' Cushing, Okla., refinery, has been named assistant to the vice president in charge of refining.

D. L. Baars, geologist with Shell Oil Co., has been transferred to the Houston division from Pacific Coast area. **W. H. Broman,** seismic party chief in Shell's Midland, Tex., area, has been transferred to Houston as geophysicist.

Albert L. Vitter, Jr., The California Co., has been elected 1959 chairman of the southern district of American Petroleum Institute's Division of Production. He succeeds **Roy A. Bobo,** Phillips Petroleum Co., who was named chairman of the district advisory committee. **R. A. Buschman,** Field Drilling Co., is secretary-treasurer. Elected district vice chairmen were **Walter Kalteyer,** Hunt Drilling Co., vice chairman for southwest Texas; **Carl A. Kinney,** Atlantic Refining Co., southwest Louisiana; **Jack Robbins,** Skinner Corp., Balcones area; **Paul Clinkenbeard,** Dowell division of Dow Chemical Co., Ark-La-Tex area; **W. J. Green,** Reed Roller Bit Co., southern Louisiana; **J. C. Brown,** Sun Oil Co., Rio Grande Valley area; **Thomas Pennington,** Humble Oil & Refining Co., Texas-Gulf Coast; **Earl White,** Mustang Drilling Corp., East Texas; and **J. J. Harper,** Lane-Wells Co., south central Texas. Officers were elected at the southern district's recent meeting in New Orleans.

L. B. Mulloy, station foreman with Service Pipe Line Co., has been transferred to El Reno, Okla., from Sterling City, Tex.

Stanley N. Warburton, formerly with Magnolia Petroleum Co., has joined George G. Iles & Associates, Lake Charles, La., consulting firm.

Harold G. Freedman, former North Texas-Panhandle division production engineer for Continental Oil Co., has joined Wolfson Oil Co. of Dallas as manager of production and exploration. He has been with Continental since 1947.

Colman C. Casey, West Texas district manager in Midland, Tex., for Monterey Oil Co., has been transferred to Jackson, Miss., as district manager at the company's new office there. **James D. Bryan, Jr.,** has been transferred from New Orleans to Jackson as geologist for the area.

▶▶▶ Personals

Dr. Thomas Aczel has joined Humble Oil & Refining Co.'s research and development division in Baytown, Tex.

William Siebens has joined Siebens Leaseholds, Ltd., Calgary, as petroleum engineer and treasurer.

John J. Wanner, district engineer for Kirby Petroleum Co. in Denver, has resigned to open consulting offices there.

Donald G. Carpenter, formerly with Pan American Petroleum Corp., has joined the production and exploration department of Monsanto Chemical Co.'s Lion Oil division in Casper, Wyo. **Ivan A. Miller,** formerly with H. L. Hunt Oil Co., has joined the Lion Oil division's sales department in El Dorado, Ark.

Nomads, IPE Plan Welcome for Oil Men From Abroad

Making plans for registration and greeting of over 2,000 foreign visitors expected at the International Petroleum Exposition in Tulsa in May are these IPE and Tulsa Nomads executives. Seated, from left to right, are William B. Way, general manager of IPE; W. K. Warren, chairman of Warren Petroleum Corp. and IPE president; Arch Campbell, Detroit diesel division of General Motors Corp., retired, Nomads office manager for IPE. Standing, left to right, are E. M. Donovan, Martin-Decker Corp., executive committee of Tulsa Nomads; Don Collins, Republic Supply Co., IPE committee of Tulsa Nomads; John Pearce, Superior Iron Works & Supply Co., Inc., Nomads governor's committee; and O. B. Irizarry, Petroleo Interamericano, president of Tulsa Nomads. Official delegations from foreign countries will be met on arrival in Tulsa by Oklahoma Governor J. Howard Edmondson and a delegation of Nomads, and non-official delegates will be met by Nomads committees. To date, IPE has received 1,400 requests from abroad for housing facilities at the show. Largest delegation so far is 62 from Mexico, and the delegation from India will come the greatest distance.

Personals

Howard S. McCray, chairman of the board and chief executive officer of Texas-Zinc Minerals Corp., has been named assistant to the president of The Texas Co. McCray joined Texaco in 1926. He has been superintendent of refineries at Sunburst, Mont.; Amarillo, Tex., and Lawrenceville and Lockport, Ill. He was also manager of the refining department's operations division and manager of the purchasing department at one time. He became chief executive officer of Texas-Zinc Minerals, a subsidiary of Texaco and New Jersey Zinc Co., last year.

B. H. Wierick has been transferred by American Petrofina, Inc., from Lafayette, La., to Denver as district geologist.

J. B. Harrison, operating superintendent for Atlantic Refining Co.'s offshore activities, will become assistant to the vice president of foreign and domestic production in June. He succeeds **Ross Williams,** who was recently transferred to the valuation and budget division. Harrison had held the offshore job since 1955.

D. G. Russell, reservoir engineer for Shell Oil Co., has been transferred to the Houston division from the Midland, Tex., area. **E. C. Fiedorek,** petrophysical engineer in Midland, has been transferred to the Houston division as exploitation engineer.

Thomas J. Farrell, Jr., Union Carbide Olefins Co., has joined the petroleum division of Union Carbide Corp.'s purchasing department. He will be purchasing agent in charge of gasoline, fuel oil, waxes, lubricants, solvents, and other industrial products for all Union Carbide's units.

The Oil Industry Conservation Forum has named an 11-member subcommittee for the New Mexico region. Regional subcommittees of the forum, an industry group seeking to cut production costs, are composed of members who live in the area or operate in it. **James E. Low,** Amerada Petroleum Corp., Tulsa, is chairman of the New Mexico group. Other members are **Robert O. Anderson,** Malco Refineries, Inc., Roswell; **Al Greer,** Farmington; **John M. Kelly,** Roswell; **Paul Rutledge,** Rutledge Drilling Co., Santa Fe; **Harvey E. Yates,** Artesia; **Ben Howell,** El Paso Natural Gas Co., El Paso; **Robert J. Leonard,** Leonard Oil Co., Roswell; **D. D. Bodie,** Cities Service Oil Co., Hobbs; **E. N. Van Duzee,** Shell Oil Co., Midland, Tex.; and **N. G. Condra,** Pan American Petroleum Corp., Fort Worth.

Kendall Greene, director of commercial research, petrochemicals, for Gulf Oil Corp., has been assigned to Goodrich-Gulf Chemicals, Inc., as director of economics and planning. A graduate of Georgia Tech and Harvard School of Business Administration, Greene has been with Gulf since 1951. He will headquarter in Cleveland.

Walter S. Hallanan, chairman of the National Petroleum Council, has named a special committee on national emergency oil and gas mobilization. The committee, headed by Hallanan, will make a study for the Interior Department on the plan developed by the Office of Oil and Gas for handling petroleum affairs in a national emergency. **R. G. Follis,** Standard Oil Co. of California, was named vice chairman. **J. Ed Warren,** Cities Service Oil Co., and **Dr. Robert E. Wilson,** formerly of Standard Oil Co. (Ind.), are special assistants to the chairman. Chairmen of the regional committees include **P. C. Spencer,** Sinclair Oil Corp.; **J. C. Donnell II,** Ohio Oil Co.; **C. Pratt Rather,** Southern Natural Gas Co.; **Reid Brazell,** Leonard Refineries, Inc.; **Bruce K. Brown,** Petroleum Chemicals, Inc.; **Glenn E. Nielson,** Husky Oil Co.; and **D. T. Staples,** Tidewater Oil Co.

Deaths

George A. Schwab, 58, Tulsa independent and former land department manager for the old Sunray Oil Corp., died March 30 in a Tulsa hospital. Schwab entered the oil business with Phillips Petroleum Co. in 1920. He later joined Barnsdall Oil Co. and was land department manager when Barnsdall was taken over by Sunray in 1950. He retired from Sunray in 1953 to become an independent operator. Active in association work, he was a former chairman of Mid-Continent Oil Scouts and Landman's Association, now the National Oil Scouts and Landmen's Association.

Henry Tuttle, 62, president of Michigan Consolidated Gas Co., died March 26 in a Detroit hospital after an illness of several months. Tuttle joined Michigan Consolidated in 1920. He had served the company as vice president, controller, treasurer, and executive vice president before becoming president in 1952. He was elected a director of American Natural Gas Co., parent of Michigan Consolidated, in 1951. He was a consultant to the gas planning division of Petroleum Administration for Defense during World War II and was a former president of the Michigan Gas Association.

Albert M. Guthrie, newly appointed construction machinery general sales manager for Gar Wood Industries, Inc., died March 22 in a Pontiac, Mich., hospital. Guthrie had been West Coast sales manager for the company since 1952. He had recently been promoted to general sales manager and was in the process of moving to Findlay, Ohio, when he became ill.

J. R. Sharp, 59, Tulsa drilling contractor, died March 31 in a Chicago hospital. Sharp had been in the drilling business since 1924. In recent years most of his operations were in West Texas. He was a director of the First National Bank & Trust Co. of Tulsa and was a leader in agriculture and cattle raising in the area.

Lee Roberts, 45, driller with Pike Drilling Co., died March 23 in a Bakersfield, Calif., hospital.

Louis W. Shank, 59, manager of Ethyl Corp.'s suggestion system, died March 26 in Bronxville, N. Y., after a brief illness. Shank was southern regional operations manager for Ethyl in Tulsa before moving to New York in 1950.

Burton W. McCune, 69, operator of a Bakersfield, Calif., oil tool rental service, died March 23 in Bakersfield after a brief illness. McCune was a driller with Pacific Oil Co. and was with Standard Oil Co. of California before going into business for himself.

to all NATURAL GASOLINE MEN

GREETINGS

from the

NATURAL GASOLINE SUPPLY MEN'S ASSOCIATION

We are looking forward to seeing you at the

THIRTY-EIGHTH ANNUAL CONVENTION

of the NATURAL GASOLINE ASSOCIATION OF AMERICA

APRIL 22-24, 1959, BAKER & ADOLPHUS HOTELS, DALLAS, TEXAS

Members of the Natural Gasoline Supply Men's Association

The Aber Company
Airetool Mfg. Co.
Air Products, Inc.
Alco Products, Inc.
Alliger and Sears Co.
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Aluminum Company of America
American Air Filter Co., Inc.
American Meter Co., Inc.
Aquatrol, Inc.
Armco Drainage and Metal Products, Inc.
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J. B. Beaird Company, Inc.
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Engineers and Fabricators, Inc.
Ethyl Corporation

Farnsworth & Chambers Co., Inc.
Farris Engineering Corporation
The Fish Engineering Corp.
The Fisher Governor Company
Flint Steel Corporation
Flow Measurement Co.
The Fluor Corp. Ltd.
Fluor Products Co.
The Foxboro Company
France Packing Company
Fuller-Austin Insulation Company

Gardner-Denver Company
Gas Equipment Co., Inc.
Gasoline Plant Construction Corp.
General American Transportation Corp.
General Electric Company
Fritz W. Glitsch & Sons, Inc.
Goulds Pumps, Inc.
Graver Tank & Mfg. Co., Inc.
The Griscom-Russell Co.
Grove Valve & Regulator Co.

D. W. Haering and Co., Inc.
Hammel-Dahl Div.—General Controls Co.
The Happy Company
T. F. Hudgins & Associates, Inc.
Hudson Engineering Corporation

Industrial Scientific, Inc.
Ingersoll-Rand Company
Insulation & Specialties, Inc.

Jones & Laughlin—Supply Div.
Joy Manufacturing Co.

Koch Engineering Company, Inc.
James S. Kone & Company

Ladish Company
Warner Lewis Company
A. M. Lockett and Co., Ltd.
The Lubricosos Specialties Mfg. Co.
The Lunkenheimer Co.
J. A. Lupfer Company

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Manning, Maxwell and Moore
Manzel, Inc.
Market Dev. Div., Phillips Petroleum Co.
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Marsh Instrument & Valve Co.
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Moorlane Company
Moran Furnace and Sheet Metal Co.
The Mott Company

National Aluminate Corp.
National Supply Co.
National Tank Company
Naylor Pipe Company
Nickles Machine Corporation
Nitrogen Division Allied Chemical Corp.
Nordstrom Valve Div., Rockwell Mfg. Co.
Wm. W. Nugent & Co., Inc.
Nutter Engineering Co.

The Ohio Injector Co.
The Oil Daily
The Oil and Gas Journal
Oil Well Supply Div.—U. S. Steel Corp.
O. L. Olsen Company
Orbit Valve Company

Pacific Pumps, Inc.
Paramount Supply Company
Peerless Mfg. Co.
Perry Equipment Corp.
Petro-Chem Development Co., Inc.
Petrocon Engineering Co.
The Petroleum Engineer
Petroleum Refiner
Petroleum Week
Phelps Dodge Copper Products Corp.
Pierce Construction Co.
Pittsburgh Div.—Rockwell Mfg. Co.
Plastelite Engineering Co.
Plibrico Company
Podbielniak, Inc.
Pona Engineers, Inc.
Power Machinery Co.
J. F. Pritchard and Co.
Process Equipment Co.
Procon, Inc.
Puffer-Sweiven Inc.

Edw. G. Ragatz Co.
Ramsey Machine Co.
Rawson-Houlihan Co., Inc.
The Refinery Supply Company
Riddle and Hubbell
Robinson Orifice Fitting Co.
Rogers Steel Corp.
Russell Engineering Corp.

E. W. Saybolt and Company
A. O. Smith Corporation
Smithco Engineering, Inc.
Snyder Company, Inc.
Southern Engine & Pump Co.
Southern Petroleum Laboratories
Southwest Industries, Inc.
N. C. Stearns Company
Stearns-Roger Mfg. Co.
Stitt Ignition Co.
Stockham Valves & Fittings
Superior Mfg. Co.

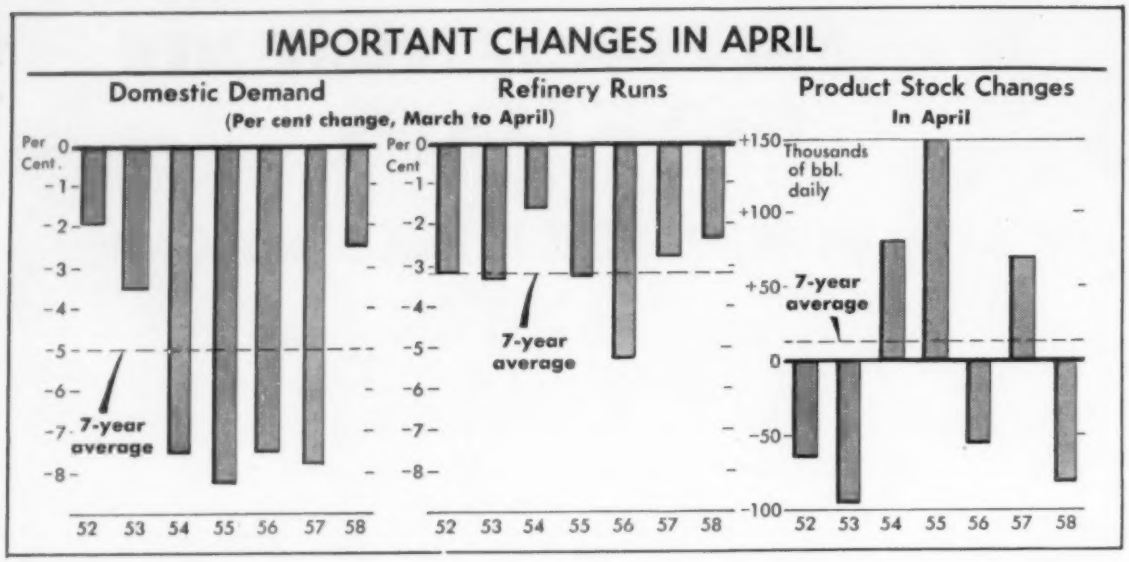
Taylor Forge and Pipe Works
Taylor Instrument Companies
Tellepsen Petro-Chem Constructors
The Tennant Company
Termomeccanica Italiana Societa per Azioni
Thurmond-McGlothlin
Trinity Steel Co. Inc.
Tube Turns Div., National Cylinder Gas Co.
Tuloma Builders, Inc.

Union Steam Pump Sales Company
United Centrifugal Pumps
United Chemical Corporation of New Mexico
Universal Oil Products Company

Vinson Supply Company
Vulcan Steel Tank Corporation

Walco Engineering & Constr. Co.
Westcott & Greis, Inc.
Western Chemical Co., of K. C., Mo.
Western Chemical & Supply Company
Western Supply Company
Charles Wheatley Company
The Wickes Boiler Co.
Wilson Supply Company
Wolverine Tube Division
World Petroleum
Worthington Corporation
Wright Chemical Corporation
Wyatt Metal and Boiler Works

John Zink Burner Company



R_x for refiners:

Lower April runs

BY JOHN C. CASPER

APRIL is an in-between month. The heating season is almost over, and gasoline demand will not reach its peak until sometime late in June. April should be a month of checking, adjusting, and planning.

If the refiner wound up the heating season with too much distillate in his tanks, April is the month for adjusting product yields. If total product inventories are too high, he will need an adjustment in refinery runs.

Here are some of the important oil shifts that take place in the month of April.

Seasonal demand skid . . . Domestic demand for petroleum products will be down this month. In recent years, demand has declined gradually from January through May. Domestic demand drops about 5% from March to April. Also, the April figure is about 5.6% below average demand for the year.

Total domestic demand is lower in April because the drop in sales of heating and industrial fuels is larger than the increase in gasoline demand. Here are the averages for the 7-year period, 1952-58.

. . . April gasoline demand showed a gain over March of 284,000 bbl. daily or 8.5%.

. . . Kerosine demand dropped 143,000 bbl. daily or 37.8%.

. . . Distillate demand decreased 482,000 bbl. daily or 26.1%.

. . . Residual-fuel demand was off 131,000 bbl. daily or 8.1%.

Since the net loss for the four major products was larger than the drop in total demand, demand for minor products showed a small gain.

Runs hit bottom . . . Refinery runs usually are at the low point for the year in April. In the period since 1952, April has been the low month in 6 out of the 7 years. The exception was in 1957 when the big buildup of product stocks forced a cutback in November. May 1952 was not included because of the strike. Over the last 7 years, the average March-to-April drop in refinery runs has been 3.1%. Most refiners agree that crude input at refineries was a little too high in February and March this year. The excess shows up as smaller-than-normal reductions in stocks of heating oils and sharp gains in gasoline inventories.

Stock reduction needed . . . In recent years, the product stock total has changed very little in April. The average has been a gain of about 14,000 bbl. daily. A reduction is needed this year, particularly for gasoline.

Current gasoline stocks are only 3,693,000 bbl. below last year, and last year's total was too high. Since 1953, the first year jet-fuel figures were separated from gasoline, total gasoline demand has increased only 16.2%. But, gasoline stocks at the end of March 1958 showed a gain of 35.6% over 1953.

Since there is a definite need for a good reduction in gasoline stocks and no need for a quick buildup in distillate stocks, refiners' plans should include sharp cuts in refinery runs.

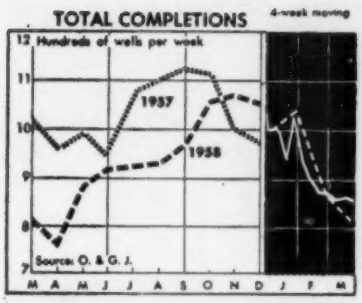
A quick look at the highlights . . .

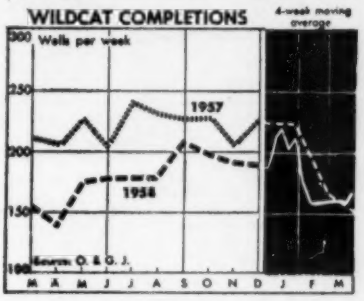
	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,201,045	DOWN	17,380	UP	940,665
Crude stocks	254,742,000	DOWN	930,000	DOWN	29,466,000
Completions	847	DOWN	48	UP	129
Refinery runs	8,007,000	DOWN	75,000	UP	969,000
Gasoline stocks	212,954,000	UP	815,000	DOWN	3,693,000
Kerosine stocks	17,833,000	DOWN	450,000	UP	661,000
Distillate stocks	76,672,000	DOWN	522,000	UP	1,547,000
Residual stocks	55,917,000	UP	835,000	UP	752,000
Four-product stocks	363,426,000	UP	678,000	DOWN	733,000
Total imports	1,785,300	DOWN	146,500	UP	380,400

Active Rotary Rigs

	3-30-59	3-23-59	3-31-58
Alabama	7	8	4
Arkansas	14	17	18
Arizona	1	1	0
California	94	99	74
Land	92	96	(†)
Offshore	2	3	(†)
Colorado	32	28	24
Florida-Land	2	2	1
Florida-Offshore	1	1	0
Illinois	26	17	21
Indiana	7	7	3
Iowa	3	2	3
Kansas	132	130	79
Kentucky	8	6	1
Louisiana	322	324	303
North	32	33	27
S-Inland waters	143	142	(‡)
S.-Land	108	111	224
Offshore	39	38	52
Maryland	1	1	0
Michigan	18	13	9
Mississippi	67	68	34
Montana	20	19	20
Nebraska	25	25	19
New Mexico	102	108	100
New York	0	0	1
North Dakota	43	43	39
Ohio	0	1	0
Oklahoma	213	215	179
Pennsylvania	11	11	12
South Dakota	1	1	0
Texas	761	759	740
S.-Inland waters	13	8	(‡)
S.-Land	170	165	178
Offshore	1	0	4
North-East	151	158	(†)
West Central	267	264	(†)
West	159	164	(†)
Utah	33	39	37
Washington	0	0	2
West Virginia	5	5	2
Wyoming	48	53	38
Total U.S.	**1,997**	2,003	1,763
Western Canada	172	199	158
Eastern Canada	0	0	2
Grand total	2,169	2,202	1,923

Hughes Tool Co. †Comparisons not available due to change in method of reporting. ‡Included in South-Land.



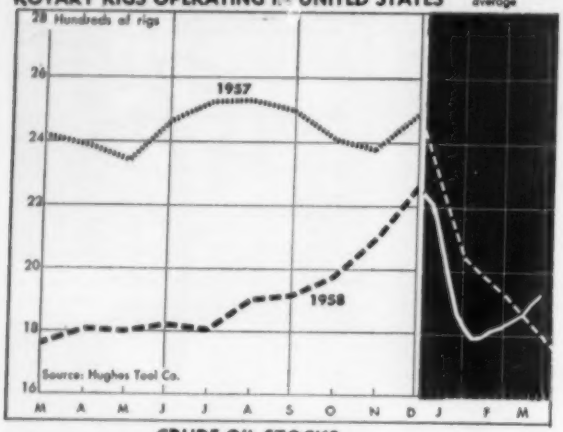


WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 28, 1959

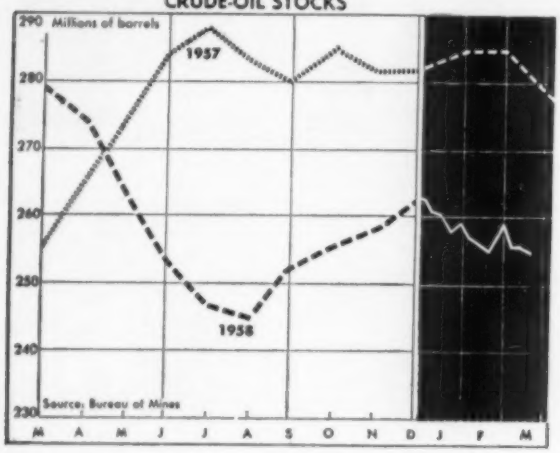
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1959	1958	Total	Crude	Cond.	Gas	Dry	1959	1958
Alabama	1	0	0	0	1	0	11,641	29	19	1	0	0	0	1	5	7
Arkansas	14	11	0	0	3	0	52,220	222	159	1	0	0	0	1	36	39
California	25	14	0	1	10	0	145,981	373	488	10	3	0	0	7	91	91
Colorado	15	4	0	3	8	0	88,630	179	184	14	3	0	3	8	104	97
Illinois	20	10	0	0	10	0	43,119	521	474	3	0	0	0	3	87	92
Indiana	17	5	0	0	12	0	21,186	159	168	9	0	0	0	9	53	56
Kansas	67	31	0	4	30	2	240,036	959	993	11	1	0	0	10	215	195
Kentucky	26	6	0	8	12	0	52,507	406	213	5	1	0	0	4	47	27
Louisiana	54	30	5	0	19	0	450,430	863	790	6	1	1	0	4	115	99
North	17	14	0	0	3	0	46,883	309	283	1	1	0	0	0	53	39
South	31	13	5	0	13	0	339,910	462	403	5	0	1	0	4	59	54
Offshore	6	3	0	0	3	0	63,637	92	104	0	0	0	0	0	3	6
Michigan	8	1	0	0	7	0	29,707	133	81	5	0	0	0	5	42	31
Mississippi	11	5	0	0	6	0	113,731	152	102	6	2	0	0	4	70	53
Montana	6	3	0	0	3	0	39,642	65	98	3	0	0	0	3	28	45
Nebraska	17	8	0	0	9	0	101,084	176	175	8	1	0	0	7	80	85
New Mexico	28	16	1	6	4	1	99,994	410	524	1	0	0	0	1	41	77
New York	0	0	0	0	0	0	0	74	131	0	0	0	0	0	4	9
North Dakota	12	5	0	0	7	0	68,483	106	106	3	0	0	0	3	27	36
Ohio	11	5	0	3	1	2	29,342	213	225	0	0	0	0	0	5	3
Oklahoma	105	52	4	11	37	1	407,530	1,406	1,733	14	2	0	1	11	224	233
Pennsylvania	0	0	0	0	0	0	0	114	23	0	0	0	0	0	3	4
Texas	374	195	8	16	147	8	1,384,450	4,484	4,504	99	6	2	2	89	882	957
Dist. 1	26	10	0	1	15	0	69,671	289	220	6	0	0	0	6	75	90
Dist. 2	16	3	3	3	7	0	74,901	177	150	6	0	1	1	4	55	42
Dist. 3	9	5	1	0	3	0	53,953	246	302	0	0	0	0	0	69	53
Dist. 4	17	6	0	4	6	1	75,291	289	281	2	0	0	0	2	83	90
East	28	18	3	0	7	0	107,044	271	325	3	0	0	0	3	63	91
Dist. 7-B	48	16	0	0	29	3	144,880	578	572	19	1	0	0	18	163	176
West	113	81	1	1	30	0	558,651	1,422	1,347	23	2	1	1	19	167	212
Dist. 9	92	40	0	2	48	2	218,640	875	966	39	3	0	0	36	174	175
Dist. 10	25	16	0	5	2	2	81,419	337	341	1	0	0	0	1	33	28
Utah	1	0	0	0	1	0	5,358	91	117	1	0	0	0	1	24	20
West Virginia	13	0	0	10	3	0	39,396	173	184	1	0	0	1	0	6	7
Wyoming	21	4	0	1	7	9	50,458	212	202	2	0	0	1	1	76	68
Misc. (Ariz.)	1	0	0	0	1	0	6,317	16	29	1	0	0	0	1	13	23
Total U. S.	**847**	405	18	63	338	23	3,481,242	11,536	11,722	**204**	20	3	8	173	2,278	2,354
Previous week	895	441	20	82	328	24	3,835,281	.....	.....	160	20	2	3	135	.....	.....
Cum. 1959	11,536	5,795	293	801	4,336	311	48,814,359	.....	.....	2,278	245	31	76	1,926	.....	.....
Western Canada	56	29	0	2	25	0	253,103	587	641	27	6	0	1	20	225	239

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	3-21-59	3-14-59	3-22-58
Pennsylvania	2,509	2,515	2,868
Other Appalachian	1,493	1,336	1,528
Illinois, Indiana, Michigan	8,485	8,405	10,150
Nebraska and North Dakota	2,144	2,156	2,633
Kansas	8,522	8,711	9,465
Oklahoma	16,435	16,439	18,014
Arkansas	1,819	1,856	2,781
Louisiana	17,922	17,727	19,549
North	3,220	2,909	3,144
South	14,702	14,818	16,405
Mississippi, Alabama, Florida	2,631	2,629	2,493
New Mexico	8,100	8,465	8,335
Texas	110,945	113,141	127,501
East Texas	9,251	8,574	7,986
West Texas	54,818	56,374	57,381
Texas Gulf	17,794	18,712	26,516
Other Texas	29,082	29,481	35,618
Wyoming	13,834	12,870	15,721
Other Rocky Mountain	9,404	9,353	7,772
California	35,160	34,793	38,858
Foreign	†15,339	15,276	16,540
Total	**254,742**	255,672	284,208

*Bureau of Mines. †Includes 5,615,000 bbl. in California.

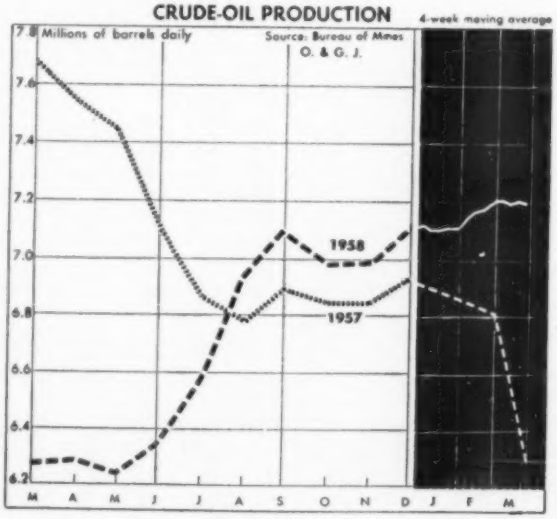
DAILY AVERAGE PRODUCTION FOR WEEK

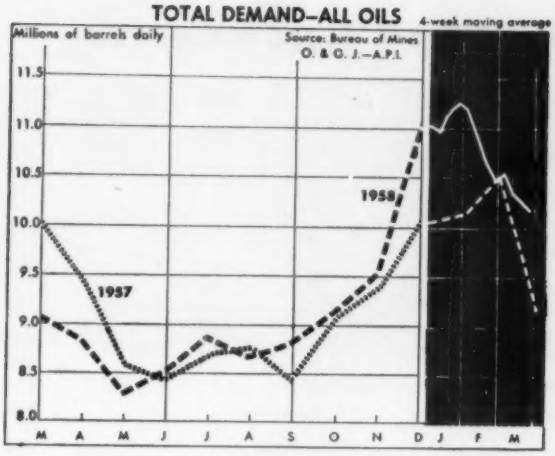
	March 28, 1959			Mar. 21
	Crude oil	Lease condensate	Total	total
Alabama	16,250	.....	16,250	16,325
Arkansas	80,200	175	80,375	80,800
California	838,500	.....	838,500	839,600
Colorado	128,600	.....	128,600	128,000
Eastern	41,100	.....	41,100	42,000
Florida	1,175	.....	1,175	1,175
Illinois	218,100	.....	218,100	229,700
Indiana	32,300	.....	32,300	31,600
Kansas	†345,170	.....	†345,170	†338,550
Kentucky	63,300	.....	63,300	63,200
Louisiana	849,000	109,200	958,200	959,650
North	110,500	4,200	114,700	116,150
South	738,500	105,000	843,500	843,500
Michigan	23,700	.....	23,700	25,700
Mississippi	116,800	5,250	122,050	122,050
Montana	81,500	.....	81,500	82,000
Nebraska	59,500	.....	59,500	59,700
Nevada	100	.....	100	100
New Mexico	287,000	6,000	293,000	293,000
North Dakota	38,400	.....	38,400	42,900
Oklahoma	563,600	.....	563,600	566,350
Texas	†2,773,000	73,300	†2,846,300	†2,846,300
Dist. 1	43,000	3,200	46,200	46,200
Dist. 2	110,000	8,400	126,400	126,400
Dist. 3	373,000	34,400	407,400	407,400
Dist. 4	200,000	9,000	209,000	209,000
Dist. 5	32,000	400	32,400	32,400
Dist. 6	123,000	7,600	130,600	130,600
East Texas field	159,000	.....	159,000	159,000
Dist. 7-B	145,000	150	145,150	145,150
Dist. 7-C	133,000	3,650	136,650	136,650
Dist. 8	1,134,000	3,300	1,137,300	1,137,300
Dist. 9	206,000	2,200	208,200	208,200
Dist. 10	107,000	1,000	108,000	108,000
Utah	111,700	.....	111,700	112,500
Wyoming	338,000	.....	338,000	337,100
Others	‡125	.....	‡125	‡125
Total U. S.	7,007,120	193,925	**7,201,045**	7,218,425
Change from previous week, down			**17,380**	
Canada	†	.....	†	†530,900

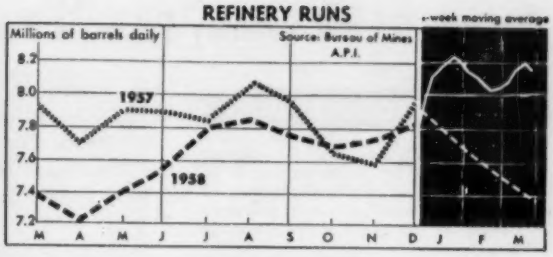
Total U. S. production, Jan. 1-Mar. 28 ..... 623,999,800 bbl.
Same period last year (crude plus cond.) ..... *579,210,000 bbl.

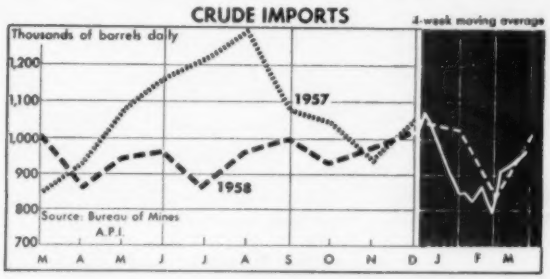
*Includes 14,321,020 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington.

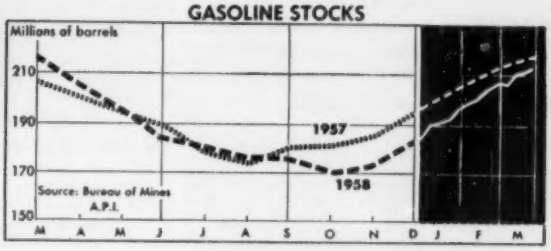
CRUDE-OIL PRODUCTION

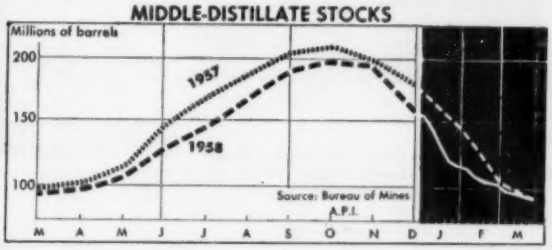


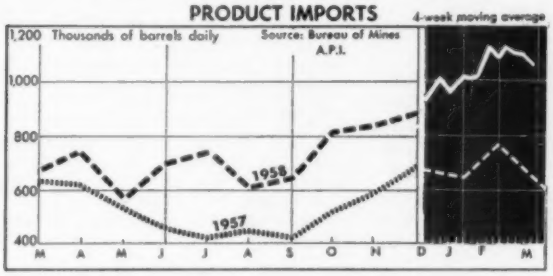

TOTAL DEMAND–ALL OILS
4-week moving average
Millions of barrels daily
Source: Bureau of Mines
O. & G. J.—A.P.I.
1957
1958
M A M J J A S O N D J F M

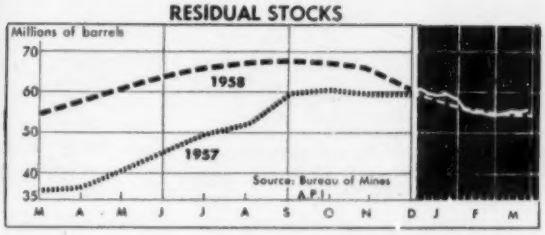












API REFINERY REPORT, MARCH 27, 1959

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, March 1958: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,186	539.6	41.1	384.1	153.0	47,180	7,723	27,525	13,057	1,126	468.7	36.1	299.7	204.0
Appalachian:														
Dist. 1	104	43.6	3.1	22.7	12.7	4,828	370	1,686	225	92	39.0	5.1	23.6	9.8
Dist. 2	105	46.1	6.3	18.6	17.9	2,676	307	760	277	106	46.7	6.9	21.5	12.0
Ind., Ill., Ky.	1,453	737.7	66.1	318.6	162.4	34,081	3,263	10,159	3,208	1,358	681.0	80.1	286.9	169.1
Minn., Wis., Dak.	91	45.9	2.3	24.6	12.0	6,531	479	3,019	386	96	42.1	4.5	26.7	12.9
Okla., Kans., Mo.	732	401.0	13.6	168.6	27.7	22,285	775	6,362	1,028	627	340.0	13.0	160.5	30.3
Inland Texas	234	166.3	6.9	36.0	19.4	7,971	324	1,275	2,126	248	182.2	9.0	46.1	21.0
Texas Gulf Coast	1,866	909.3	91.0	472.3	213.4	27,500	2,228	7,260	5,617	1,716	813.3	108.6	437.9	184.7
La. Gulf Coast	696	381.9	14.1	193.8	55.3	12,133	1,227	4,164	1,350	600	335.9	59.8	133.9	45.0
No. La. and Ark.	103	53.8	6.6	25.7	3.6	5,266	556	1,414	78	101	46.4	6.5	21.0	8.9
Rocky Mountain:														
New Mexico	23	11.7	0.1	3.6	2.6	726	34	176	18	17	7.3	0.2	3.4	2.8
Other Rocky Mt.	275	133.0	1.9	64.0	36.0	7,398	217	2,523	983	237	115.1	1.1	56.0	28.4
West Coast	1,139	538.7	4.3	164.7	265.0	29,379	380	10,349	27,564	1,032	467.9	5.7	132.8	286.2
Mar. 27, 1959	8,007	4,008.6	257.4	1,897.3	981.0	212,954	17,883	76,672	55,917	7,356	3,585.6	336.6	1,650.0	1,015.1
Mar. 20, 1959	8,082	4,084.6	271.7	2,072.4	1,034.1	212,139	18,333	77,194	55,082	.....	.....	.....	.....	.....
Mar. 28, 1958	7,038	3,632.4	318.0	1,623.3	997.7	216,647	17,222	75,125	55,165	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (89 octane)	11.625-12.00
Premium (99 octane)	14.625-15.00

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	10.00-10.25
Regular (92 octane)	10.25-10.50
Premium (97 octane)	11.375-11.75
Premium (98 octane)	11.50-11.75

California (rack) (Los Angeles):

Regular (88 octane)	12.65
Premium (94 octane)	13.65
Premium (98 octane)	14.65

Caribbean area (cargoes):

Regular (87 octane)	9.875
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4.5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

Kerosine 42-44	10.50-10.75
Diesel oil (58 d.i. and above)	10.25-10.50
Distillate No. 1	10.25-10.50
Distillate No. 2	9.50-9.75

Gulf Coast (cargoes):

★ Kerosine 41-43	10.25-10.375
★ Distillate No. 2	9.75-9.875

New York Harbor (barges):

Kerosine 41-43	11.50
Distillate No. 2	11.00
Diesel fuel, 48-52 d.i.	11.25

Caribbean area (cargoes):

Distillate No. 2	9.875

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank car	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):

Residual fuel (max. 1% S)	$2.00-2.05

Gulf Coast (cargoes):

Bunker C fuel	$2.00

New York Harbor (barges):

Bunker C fuel	$2.37

Caribbean (cargoes):

Bunker C	$2.00

California (rack):

Bunker C fuel, Los Angeles	$2.15

LUBRICATING OILS

Mid-Continent (Group 3):

150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5

Pennsylvania Grade:

145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.49	....	$2.35	2.06
21-21.9	2.50	2.52	....	2.38	2.11
22-22.9	2.60	2.55	....	2.41	2.16
23-23.9	2.69	2.58	$3.44	2.44	2.21
24-24.9	2.78	2.61	3.46	2.47	2.26
25-25.9	2.84	2.64	3.48	2.50	2.31
26-26.9	2.90	2.67	3.50	2.53	2.36
27-27.9	2.95	2.70	3.52	2.56	2.49
28-28.9	3.01	2.73	3.54	2.59	2.54
29-29.9	3.07	2.76	3.56	2.62	2.59
30-30.9	3.12	2.79	....	2.65	2.63
31-31.9	3.20	2.82	....	2.68	2.67
32-32.9	3.27	2.85	....	2.71	2.71
33-33.9	3.34	2.88	....	2.74	2.75
34-34.9	3.41	2.91	....	2.77	2.79
35-35.9	3.47	2.94	....	2.80	2.83
36-36.9	3.52	2.97	....	2.83	2.87
37-37.9	3.56	2.99	....	2.86	2.89
38-38.9	....	3.01	....	2.89	2.91
39-39.9	....	3.03	....	2.92	2.93
40-40.9	....	3.05	....	2.95	2.95

*Another Oklahoma (sweet) schedule has a top of $3.08 with gravity variations to $2.52 for below 20°. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 1-26-59; East of California, January 3-10, 1957; Pennsylvania Grade 4-1-59.

FLAT PRICES

Louisiana:

Sweet Lake	$3.00

Texas:

East Texas	3.25
Conroe	3.53
Van	3.08

Pennsylvania Grade:

★ Bradford	4.15
★ Middle District	3.97
★ Southwest Pennsylvania	3.70
★ West Virginia	3.57
Buckeye Grade	3.25

Illinois Basin	**3.00**

Canada:

Leduc-Woodbend	2.53
Redwater (Alta.)	2.42
Smiley (Sask.)	2.18
Pembina	2.38

FOREIGN

Venezuela:

Cumarebo, 48°-49.9°, Tucupido	3.51
San Joaquin, 41°-41.9°, Puerto La Cruz	3.25
Oficina, 35°-35.9°, Puerto La Cruz	2.90
Tia Juana medium, 26°-26.9°, Amuay*	2.40
Quiriquire, 16.0°-16.4°, Caripito	2.15
Lagunillas heavy, flat, Las Piedras*	2.10
Bachaquero, flat, 15°-16°, Las Piedras*	1.93

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes f.o.b. lifting port):

Arabian, about 34°, Ras Tanura	$1.89
Iranian, 34.0°-34.9°, Bandar Masur	1.86
Iranian, 34.0°-34.9°, Abadan	1.81
Iraq, 36.0°-36.9°, Fao	1.82
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.67
Qatar, about 41°, Um Said	2.05

Middle East, E. Mediterranean:

Arabian, about 35°, Sidon	2.29
Iraq, about 35°, Tripoli, Banias	2.29

Far East (cargoes, f.o.b. Lutong, Sarawak):

★ Seria Light, 37°	2.57

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., clean (USMC —27.5%)	$2.07
★ Carib.-U.S.N.H., dirty (ARTS —67.5%)	0.89
P.G.-U.K., dirty (Scale—75%) (18s. 3d.)	2.56
E. Med.-U.K., dirty (Scale—62.5%) (10s. 8d.)	1.49

EQUIPMENT MEN

. . . in the News

Guests attend Houston chapter of Nomads meeting

Left to right are Jack Enen, International Drilling Co., Houston; D. D. Lewis, Import Tools, Ltd., Calgary, Alberta; Charles Alcorn, Falcon-Seaboard Drilling Co., speaker of the meeting; and petroleum engineers Belis S. Mello and Ayrton Lopes Bandeira.

Ralph Lynch is appointed

Ralph Lynch

. . . general sales manager of Southern Mill Homes Co. of Tulsa, announces A. R. Tandy, president of the prefabricated-home company. Lynch has owned his own construction firm, and is a veteran of 11 years in the sales, design, real-estate planning, and construction of prefabricated homes. He recently resigned as general sales manager of Universal Homes, Inc., of Midland, Mich., a position he held for 3 years.

W. S. Rockwell Co. announces

. . . the addition of Rawson & Co., Inc. of Houston, and Rawson Co., Inc., of Baton Rouge, as sales representatives for the Fairfield, Conn. firm. The new representatives will deal with Rockwell's butterfly, slide, and special valves in south Texas, southern Louisiana, and southern Mississippi.

Precision Scientific Co. names

. . . four new district managers. New managers, along with headquarters are: James F. Ramseth, Chicago; Robert G. Mullins, Houston; Wallace H. Dickson, Bala-Cynwyd, Pa.; and Melvin M. Swartz, San Francisco.

Harold Brown Co. makes

. . . a new construction addition to its plant and home-office facilities in Houston, reports president Harold Brown. The addition includes ground-floor coverage and a complete second floor.

New equipment exhibits

. . . are being shown for the first time to the public in a joint display in London, England by Ruston & Hornsby, Ltd. and the company's associates, Davey, Paxman & Co., Ltd.

Exhibits include water-cooled and air-cooled diesel engines, including the largest air-cooled power unit in commercial production in the world today. Another feature is a gas-bearing circulator, designed for circulating gas at high temperature and pressure without leakage.

Plenty & Son, Ltd. reports

. . . record export orders based on value and volume. Within the past month, large export orders have been placed from Finland, New Zealand, France, South Africa, and Germany.

COMPLETING PLANS for the exhibition of Deutz air-cooled diesel engines at the upcoming International Petroleum Exposition are (left to right) H. Antwerber, field engineer of Diesel Energy Corp., New York City; Dr. F. W. Lohmann, vice president of Diesel Energy; and Paul Soule, president of Texoma Supply Co., Tulsa. Texoma Supply is the agent for Deutz engines to the American petroleum industry.

Mountain Iron & Supply starts

. . . construction of its second new sales office in West Texas, located at Perryton. It's scheduled for opening by June. 1.

Clarence Wiley, formerly in charge of Mountain Iron's Pawhuska, Okla., store, has been named superintendent. Bill Troutman has been assigned as field man.

Misco's first West Texas store was opened recently in Houston. E. C. Bird is the office manager.

Robert Davis named manager

. . . of two-way radio sales in the midwest area by Motorola Communications & Electronics, Inc., a sales

R. F. Davis

Eric Goleas

and service subsidiary of Motorola, Inc.

Taking Davis' former position as regional manager in the areas of Illinois, Indiana, Wisconsin, and Michigan is Eric Goleas.

Davis will report to Robert Swift, vice president and midwest area manager. Davis has been with Motorola for 12 years in sales and sales-management posts.

Goleas has been with the company 10 years, the last three of which he spent as zone manager in Chicago. Both men will make their offices in Chicago.

Richard C. Savacool appointed

. . . assistant district engineer at Greensburg, Ky., for U.S. Steel Corp.'s Oil Well Supply Division. The announcement comes from C. H. Maynard, the division's eastern area manager. Savacool was employed in 1958 by Oilwell as a junior engineer at Bradford, Pa.

Grove Valve & Regulator opens

. . . new warehouse facilities at Longview, Tex., for company operations in the southwestern states. The announcement comes from M. H. Grove, president of the company. The new facility triples available warehouse space.

At the same time, Grove closed its Houston warehouse and moved its Houston headquarters to another locale in the city.

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FOR SALE EQUIPMENT

WELL DRILLS - CORE DRILLS. Everything for well and core drilling in both new and used equipment at money saving prices. Fishing tools rented. Send for bulletins. Pressey & Son, Pueblo, Colo.

USED REDA PUMP. 135 HP Mtr., 36 Stage Type Y 180, Protector, 150 KVA Maloney Transformer & Switch, 100 HP Control Panel, with 1650' cable. Contact Crescent Oil Well Supply Co., 809 Kennedy Bldg., Tulsa, Oklahoma. Ph.—LU 4-7073.

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment: from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

2 ROTARY RIGS, 7,500' and 9,000' maximum, excellent condition, now running, liberal terms. Box L-255, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: CHEAP! Wildcat Drilling Rigs. One (1) #2 National all-steel drilling rig complete with 10" x 60' Sheer Poles with Sheaves and galvanized guy lines, Waukesha gas-gasoline engine, less drilling tools and cables. One (1) #3 National, similar to above, except short band wheel. Will take $3,000.00 for both—less than cost of one engine. Cable Tool Supply Company, P. O. Box 305, Princeton, Indiana. Phones: FUlton 5-4831, 5-4832.

NEED PIPE?
8" Steel, Wt. 28 lbs., beveled for welding, straight machine cleaned, coated, strictly No. 1 grade. Pittsburgh Testing Lab. report furnished.
Indiana-Ohio Pipe Co.
P. O. Box 323 Phone 3-4674
DECATUR, INDIANA

PIPE FOR SALE
7,000' of 24" OD x ⅜" Wall 94.62# New Prime National Tube Seamless, Grade B, D.R.L., Line Pipe, located Suntide Refinery Company, Corpus Christi, Texas, mill price delivered. Direct inquiries, Box 2205, Tulsa, Oklahoma.

We Own and Offer

Compressors
5—IR XVG-6, XVG-4
1—Clark RA-8
3—Clark RA-5, RA-3

Exchangers & Heaters
4—Petrochem ½-1¼ Mil. BTU.
18—Steel 200—3,200 sq. ft.
12—Adm. 300—2,400 sq. ft.
6—Si. St. & Chr. 250—1,200 sq. ft.
3—Unused U-Tube 340—1,128 sq. ft.

Vessels & Towers

6'x38' 10 Tr. 480#	2'x45' 24 Tr.
4'x50' 12 Tr. 450#	18"x32' 15 Tr. 160#
4'x57' 10 Tr. 250#	4½'x17' 500#
8'x75' 20 Tr. 25#	12'x43' 25#
5'x90' 40 Tr. 135#	5 Pkd. Towers 12"—24"

BRILL EQUIPMENT COMPANY
4101 SAN JACINTO ST., HOUSTON 4, TEXAS, JA 6-1351
2401 THIRD AVE., NEW YORK 51, N. Y.

FOR SALE EQUIPMENT

FOR SALE: Franks 2000 portable rotary rig, A-1 condition. All equipment ready to put in field. Karchmer Pipe and Supply, Centralia, Ill.

FOR SALE—200,000 feet of 10¾" OD—40#—8V LW No. 1 Grade Line Pipe. T&C or PE. Lundquist Pipe & Supply Co., 325 Wright Bldg., Tulsa, Okla. Ph. LU 5-8850.

FOR SALE: RA-2 Clark, 200 HP., RA-32 Clark, 300 HP. New spare parts. Alfred B. Kern, 305 Kennedy Building, Tulsa, Oklahoma.

1500 FAILING, drill pipe, water truck, Star 71. Drilling Service core barrel, 3½ x 20. Fred Butler, Box 481, Pueblo, Colo.

FOR SALE:

1—Used hydraulic casing pulling rig, in good condition and ready to operate $6,000.00

1—Used Cardwell all steel draw works, Serial #KL-14 ..... $1,200.00

1—Used 75 KVA E. M. Mfg. Co. 60-KW Generator Serial #2691 with Superior Type GB3 engine Serial #82178, Type 56 Happy engine jacket water cooler, 30 HP Square D master switch, 440-volt Cutler-Hammer control, 3x3½ Wisconsin Type VE4 air-cooled motor direct connection to 3-HP Gardner-Denver compressor, volume tank, and 18½'x16½' portable steel sectional building $1,900.00

ALL PRICES ARE F.O.B.
WICHITA FALLS, TEXAS.

GUEST & MOLLER, INC.
1109 CITY NATIONAL BUILDING
WICHITA FALLS, TEXAS
PHONE 322-7888

FOR SALE EQUIPMENT

FOR SALE: 1,000 ft. Mayhew rig mounted on 4-wheel drive truck with up to 1,200 ft. drill pipe, fully equipped. Also 1—22-W Bucyrus-Erie mounted on Ford truck with or without tools. Eugene Smith, Box 363, Caney, Kansas.

EQUIPMENT BARGAINS

11 **KINNEY ASPHALT PUMPS** jacketed Type SD422-SD534-SD848

48 **HEAT EXCHANGERS,**
Steel 800—4,400 Sq. Ft.
Admiralty 350—4,600 Sq. Ft.
Cupro Nickel 177—5,200 Sq. Ft.

4 **BROWN FINTUBE EXCHANGERS,** 189 Sq. Ft.

6 **SUCTION HEATERS FINTUBE,** 101—1,098 Sq. Ft. New.

2 **PETROCHEM HEATERS,** 19 & 25 Million BTU.

1 **AIR HEATER,** 10,000 SCFM 100°-1200° Direct Fired.

1 **AIR BLOWER,** 11,800 CFM, 11 psi, 600 H.P. Turbine Drive.

2 **TOWERS,** 3' x 38'—8 Trays, 40 psi. 2'6" x 60'—24 Trays, 180 psi.

1 **OTIS ELEVATOR,** 2,500#, 182' Travel

1 **REBOILER,** 165 Sq. Ft., 150 psi. shell, 300 psi. tubes.

5 **STEAM PUMPS,** 8" x 4½" x 12"—4½" x 4" x 6"—8" x 4" x 6"

3 **CENT. PUMPS,** Vertical XP Motors
2,600 GPM at 173 Ft.—300 H.P.
1,500 GPM at 150 Ft.—125 H.P.
680 GPM at 150 Ft.— 40 H.P.

1 **PROPORTIONEERS PUMP,** 3XL, 5 H.P.

Heat & Power Co., Inc.
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CARDWELL L-350 drawworks, diesel powered, Allison torque converter, Parkersburg hydromatic brake. Two pumps, three mud tanks, shale shaker, kelly, swivel, rotary table, block and hook, drill collars and nearly complete set drilling tools and accessories. For complete inventory write McClelland Engineers, Inc., 2649 North Main, Houston, Texas.

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1—USED EMSCO GB 500 Rig, Serial No. 110, Air Controls, Two Engine Compound, 2 Climax V-80 Engines, Pump Drive, Foster Catheads, $25,000.00. 1—USED Gardner-Denver FQFXQ Slush Pump, Serial No. 12687, 7¼"x16", complete with 14 Groove Pulley, for above rig. $12,000.00. Wilson Manufacturing Company, Inc., Wichita Falls, Texas.

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Petroleum Engineer

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Proven and unproven leases in GREEN COUNTY, KY., also adjoining counties. Shallow drilling.

Drilling deals arranged.

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With the view to carrying out operations defined in the Petroleum Act, District XVIII of the petroleum districts of Iran shall be declared as "open" with effect from July 1, 1959. Interested parties shall submit written proposals to the N.I.O.C., to be received in Teheran not later than September 1, 1959. Copies of the N.I.O.C. pre-announcement containing detailed information may be obtained from the Embassy of Iran, Washington, D. C.

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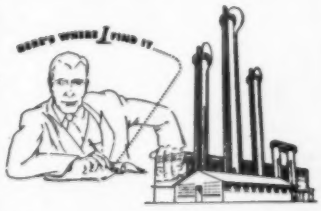

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in this issue

Albertson & Co., Inc. 132, 133
Aldrich Pump Company, The 142
American Iron & Machine Works Co. ..... Back Cover
American Steel & Wire Division 64
Armour Company—
Armour Chemical Division 24, 25
Atlas Pipe Inc. 31

Baker Oil Tools, Inc. 74
Baroid Division, National Lead Co. 66
Bendix Aviation Corporation 16
Bethlehem Steel Company 137
Black, Sivalls & Bryson, Inc. 20
Brown & Root, Inc. 99
Brown Oil Tools, Inc. 45

Cable & Stephens 198
Cameron Iron Works, Inc. 176
Chicago Bridge & Iron Company 15
Christensen Diamond Products 199
Classified Advertising 214, 215, 216
Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division 100, 101
Columbia-Southern Chemical Corporation, Subsidiary of Pittsburgh Plate Glass Company 52
Continental-Emsco Company, a Division of the Youngstown Sheet and Tube Company 17
Continental Oil Co. 190
Crose Manufacturing Co., Inc., M. J. 162
Crouse-Hinds Company 1

De Laval Steam Turbine Company 44
Deere, John—
Industrial Division 26
Dixell Development and Manufacturing Co. 198
Dowell ..... 95, Inside Back Cover
Downtown Airpark Incorporated 177
Dresser Industries, Inc. 148, 149
Drilling & Service, Inc. 179
du Pont 37, 38, 51
Duriron Company, Inc., The 76

Edward Valves, Inc. 65
Ethyl Corporation 92, 93
Evinrude Motors Division of Outboard, Marine & Mfg. Co. 164

Fairbanks, Morse & Co. 128
First National Bank & Trust Co. of Tulsa, The 200
Ford Motor Company 157, 174, 175
Foster Cathead Company 197
Foxboro Company, The 22

General Electric Company 119
Geophysical Service, Inc. 187
Glidden Company, The
Industrial Paint Division 150
Glitsch & Sons, Inc., Fritz W. 89
Goodall Rubber Company 170
Go Oil Well Services, Inc. 191
Goodrich Industrial Products Company, The B. F. 5
Grant Oil Tool Co. 188
Grove Valve and Regulator Company 12

Halliburton Oil Well Cementing Co. 8, 9, 195
Harrisburg Steel Co. 163
Hercules Tool Company 135
Hudson Engineering Corporation 167, 168
Humble Oil & Refining Co. 40

Jefferson Chemical Company, Inc. 21
Johnston Testers, Inc. 50
Jones & Laughlin Supply Division 144, 145

Kellogg Co., The M. W. 130
Kemp Mfg. Co., C. M. 159
Kittell Muffler & Engineering Company, Inc. 162

Larkin Packer Company, Inc. 182
LeBus International Engineers, Ltd. 46
Liberty Manufacturing Company of Texas 30
Liberty Mutual Insurance Company 140, 141
Link-Belt Company 7
Lone Star Steel Company 126, 127

Macdell Heater Co. 165
Magnet Cove Barium Corp. 42, 43
Master Tank & Welding 164
McDonough Marine Service 198
Mid-Continent Supply Company 29
Mission Mfg. Company 63
Motorola Communications & Electronics, Inc. 53

National Bank of Tulsa 13
National Supply Co., The 55, 56, 57, 58
National Tank Company 218
National Tube Division 28
Natural Gasoline Supply Men's Association 207
Nelson Electric Mfg. Co. 71
Nordberg Mfg. Co. ..... Inside Front Cover
Norris Manufacturer, Inc., W. C. 4
Norwood Controls Unit, Detroit Control Division American-Standard 32

Oil Center Tool Co. 201
Oilfield Equipment Corporation of Colorado 138
Oil States Rubber Co. 129
Oil Well Supply Division 6
Otis Engineering Corporation 70

Paris Distributor, Inc., Henry H. 67
Parkersburg Rig & Reel Co. 39
Peerless Mfg. Co. 27
Petroleum Distributing Co. 62
Petroleum Electric Power Assn. 41
Petroleum Equipment Suppliers Association 36
Philadelphia Gear Corporation 153
Pipe Line Technologists, Inc. 172
Pittsburgh Steel Company 154, 155
Polyken Sales Division, The Kendall Company 59, 60, 61

Rector Well Equipment Co., Inc. 11
Refinery Supply Co., The 165
Republic Rubber Division of Lee Rubber & Tire Corp. 196
Rollway Bearing Co. 202

Security Engineering Division 47
Standard Oil Company of California 72
Standard Oil Company of Indiana 125
Standard Oil Company (New Jersey) 33

Taylor Instrument Companies 68, 69
Texsteam Corporation 135
Torrington Company, The 147
Tretolite Company A Division of Petrolite Corporation 14
Tuboscope Company 19
Tulsa Paper Company 177

Union Switch & Signal Division of Westinghouse Air Brake Company 160
Union Wire Rope Corporation 48, 49
United States Steel Corporation—
American Steel & Wire Division 64
National Tube Division 28
Oil Well Supply Division 6
Universal Oil Products Co. 34, 54, 123

Viking Pump Co. 177
Vogt Machine Co., Henry 10

Welex, Inc. 18
Well Equipment Mfg. Corp. 33
Wickwire Spencer Steel Division, Colorado Fuel and Iron Corp. 100, 101
Williams Pressure Service Company 162
Wilson Manufacturing Co., Inc. 173
W-K-M Division of ACF Industries Incorporated 23

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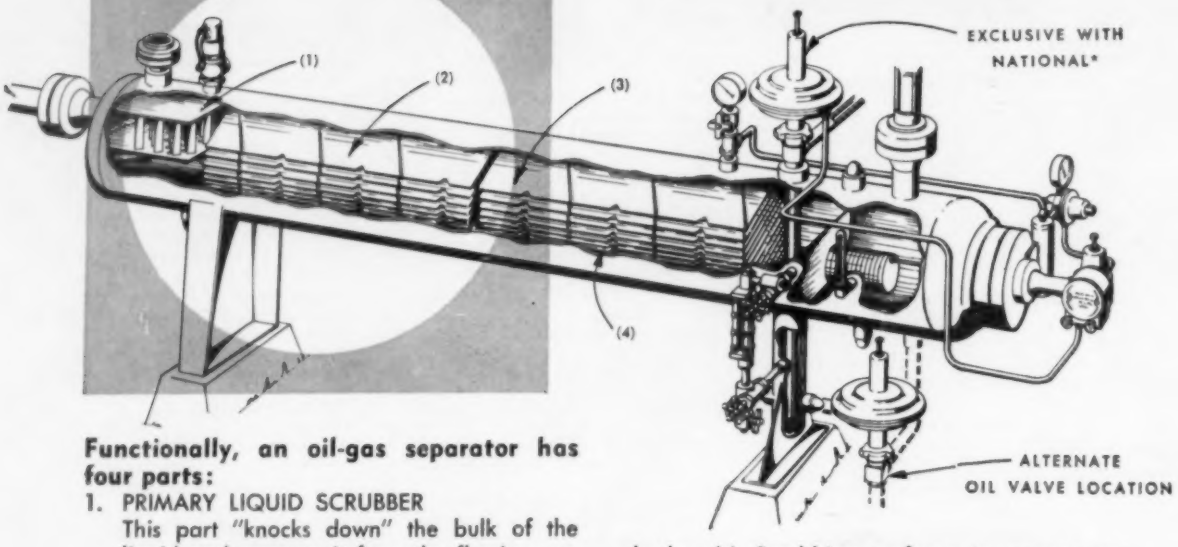

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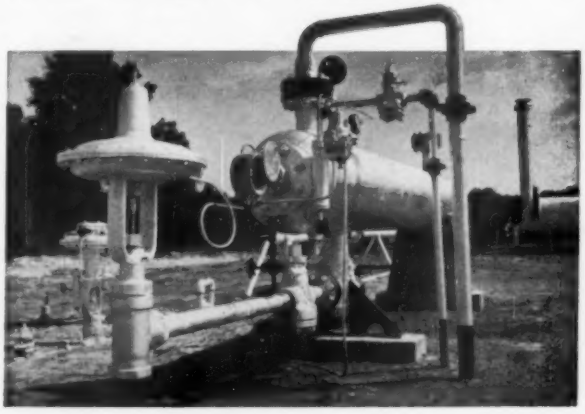

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